

**ATTACHMENT C**  
**Material Safety Data Sheets**

# Arsenic

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

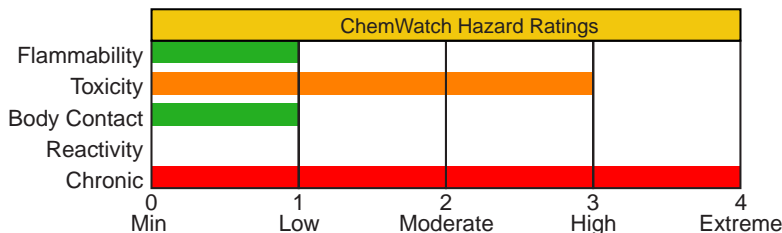
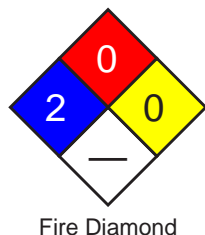
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**Material Name:** Arsenic **CAS Number:** 7440-38-2  
**Chemical Formula:** As  
**Structural Chemical Formula:** As<sub>4</sub>  
**EINECS Number:** 231-148-6  
**ACX Number:** X1002785-7  
**Synonyms:** ARSEN; ARSENIA; ARSENIC; ARSENIC-75; ARSENIC BLACK; ARSENICALS; COLLOIDAL ARSENIC; GRAY ARSENIC; GREY ARSENIC; METALLIC ARSENIC  
**General Use:** In metallurgy for hardening copper, lead alloys. In the manufacture of certain types of glass.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Arsenic		>98
<b>OSHA PEL</b> TWA: 0.01 mg/m <sup>3</sup> .		
<b>NIOSH REL</b> Ceiling: 0.002 mg/m <sup>3</sup> ; 15-minute.		
<b>ACGIH TLV</b> TWA: 0.01 mg/m <sup>3</sup> .		
<b>IDLH Level</b> 5 mg/m <sup>3</sup> (as As).		

## Section 3 - Hazards Identification



HMIS	
3	Health
0	Flammability
1	Reactivity

ANSI Signal Word

**Warning!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brittle, crystalline, silvery-black metal. Irritating to eyes/skin/respiratory tract. Chronic Effects: damage to blood-forming organs, nervous/cardiovascular systems effects. Cancer hazard. Powder is flammable.

### Potential Health Effects

**Target Organs:** liver, kidneys, skin, lungs, lymphatic system

**Primary Entry Routes:** inhalation, ingestion of dust and fumes, skin absorption

#### Acute Effects

**Inhalation:** The dust is toxic and discomforting to the upper respiratory tract and lungs.

Acute inhalation exposure can cause cough, chest pain, shortness of breath, dizziness, headache, pulmonary edema and extreme general weakness.

Prolonged or repeated exposure can cause perforation of the nasal septum.

High exposures can cause poor appetite, nausea, vomiting and muscle cramps. Heart effects with abnormal EKG can also occur with very high exposures.

**Eye:** The dust may produce eye discomfort causing smarting, pain and redness.

**Skin:** The material is moderately discomforting to the skin and may be harmful.

Exposure may result in abnormal redness (caused by capillary congestion), burning, itching, swelling, skin eruptions and dermatitis.

Toxic effects may result from skin absorption.

Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.

**Ingestion:** The solid/dust is discomforting to the gastrointestinal tract and is toxic and may be fatal if swallowed.

Symptoms of acute poisoning by ingestion, which develop within 4 hours include epigastric pain, vomiting and watery diarrhea. Blood may appear in vomitus and stools. If amount ingested is sufficiently high, shock may develop, followed by death within 24 hours.

Considered an unlikely route of entry in commercial/industrial environments.

**Carcinogenicity:** NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A1, Confirmed human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

**Chronic Effects:** Symptoms of chronic poisoning by inhalation include weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair, peripheral neuritis, blood disorders (anemia), striations on fingernails and toenails.

Long-term exposure can cause an ulcer or hole in the 'bone' dividing the inner nose. Hoarseness and sore eyes also occur.

High or repeated exposure can cause nerve damage with 'pins and needles', burning, numbness, and later weakness of arms and legs. Repeated exposure can also damage the liver, causing narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

Many cases of skin cancer have been reported among people exposed to arsenic through medical treatment with inorganic trivalent arsenic compounds. In some instances skin cancers have occurred in combination with other cancers, such as liver angiosarcoma, intestinal and urinary bladder carcinomas and meningioma. Epidemiological studies of cancer after medical treatment have shown an excess of skin cancers but no clear association with other cancers has been shown. An association between environmental exposure to arsenic through drinking water and skin cancer has been observed and confirmed. Epidemiological studies in areas where drinking water contained 0.35-1.14 mg/l arsenic elevated risks for cancers of the bladder, kidney, skin, liver, lung and colon in both men and women. Occupational exposure to inorganic arsenic, especially in mining and copper smelting, has consistently been associated with an increased risk of cancer. An almost tenfold increase in the incidence of lung cancer was found in workers most heavily exposed to arsenic and relatively clear dose-response relationships have been obtained with regard to cumulative exposure. Other smelter worker populations have been shown to have consistent increases in lung cancer incidence, as well as increases of about 20% in the incidence of gastrointestinal cancer and of 30% for renal cancer and hematolymphatic malignancies.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air. Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Quickly but gently, wipe material off skin with a dry, clean cloth.

Immediately remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

**Ingestion:** Contact a Poison Control Center.

If swallowed, and if more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.

Note: DO NOT INDUCE VOMITING in an unconscious person

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short term repeated exposures to arsenic, soluble compounds:

Treat as per arsenic poisoning.

1. Acute skin lesions such as contact dermatitis usually do not require other treatment than removal from exposure.
2. If more severe symptoms of the respiratory system, the skin or the gastrointestinal tract occur, British Anti-Lewisite (BAL, dimercaprol) may be given. Prompt administration in such cases is vital; to obtain maximum benefit such treatment should be administered within 4 hours of poisoning.
3. In addition, general treatment such as prevention of further absorption from the gastrointestinal tract are mandatory.
4. General supportive therapy such as maintenance of respiration and circulation, maintenance of water and electrolyte balance and control of nervous system effects, as well as elimination of absorbed poison through dialysis and exchange transfusion, may be used if feasible.
5. Dimercaprol is given by deep intramuscular injection as a 5% solution in peanut oil (or a 10% solution with benzylbenzoate in vegetable oil). It is usually given in a dose of 3 mg/kg, 4-hourly, for the first two days, or twice daily for up to seven days.
6. BAL Therapy is effective for hematological manifestations of chronic arsenic poisoning but not for neurological symptoms. Watch for side effects (e.g. urticaria, burning sensation in the lips, mouth and throat, fever, conjunctivitis etc).
7. Some relief results from administration of diphenhydramine (Benadryl) (1.5 mg/kg intramuscularly or by mouth every 6 hour).

BIOLOGICAL EXPOSURE INDEX - BEI

See  
DOT  
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These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Inorganic arsenic metabolites in urine	50 ug/g creatinine	End of workweek	B

B: Background levels occur in specimens collected from subjects NOT exposed  
Consult specific documentation.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Noncombustible solid

**Extinguishing Media:** Use fire fighting procedures suitable for surrounding area.

**General Fire Hazards/Hazardous Combustion Products:** Solid which exhibits difficult combustion or is difficult to ignite.

Avoid generating dust, particularly clouds of dust in a confined or unventilated space. Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.

Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.

Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Decomposes on heating and produces toxic fumes of arsenic oxides (AsO<sub>x</sub>).

**Fire Incompatibility:** Avoid contact with acids, oxidizing agents, halogens.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

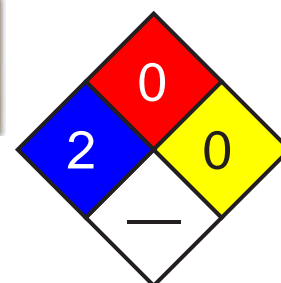
Do not approach containers suspected to be hot.

Cool fire exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

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ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Wear protective clothing, impervious gloves and safety glasses. Increase ventilation.

Use a vacuum or a wet method to reduce dust during clean-up. DO NOT dry sweep.

Place in suitable containers for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

**Large Spills:** POLLUTANT -contain spillage. Clear area of personnel and move upwind.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

If contamination of drains or waterways occurs, advise emergency services.

Shut off all possible sources of ignition and increase ventilation.

Stop leak if safe to do so.

Contain spill with sand, earth or vermiculite.

Use dry clean up procedures and avoid generating dust.

Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

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## Section 7 - Handling and Storage

**Handling Precautions:** Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Use good occupational work practice.

Avoid contact with skin and eyes.

Avoid generating and breathing dust.

Use in a well-ventilated area.

Wear protective clothing when risk of exposure occurs.

Avoid sources of heat. Avoid contact with incompatible materials. Avoid physical damage to containers.

Keep containers securely sealed when not in use.

When handling, DO NOT eat, drink or smoke.

Wash hands with soap and water after handling.

Work clothes should be laundered separately: NOT at home.

**Recommended Storage Methods:** Glass container. Plastic drum. Polyethylene or polypropylene container. Steel drum. Metal drum.

Check that containers are clearly labeled.

**Storage Requirements:** Observe manufacturer's storing and handling recommendations.

Store in a cool, dry place. Store in a well-ventilated area. Store away from sources of heat or ignition/bare lights.

Avoid storage at temperatures higher than 60 °C. Store away from incompatible materials. Store away from foodstuff containers.

Protect containers against physical damage.

Keep containers securely sealed.

Check regularly for spills and leaks.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required.

Use ventilated helmet or air-line hood to provide clean air at the breathing zone.

If risk of overexposure exists, wear NIOSH approved respirator. Correct fit is essential to obtain adequate protection.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses. Chemical goggles.

Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious, gauntlet length gloves; Rubber gloves. Neoprene gloves.

Rubber boots.

**Respiratory Protection:**

Exposure Range >0.01 to 0.1 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >0.1 to 1 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >1 to <5 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 5 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: magenta (P100)

**Other:** Overalls. PVC apron. PVC protective suit may be required if exposure severe.

Eyewash unit. Ensure there is ready access to a safety shower.

\* Preplacement and periodic medical examinations are essential for workers exposed to arsenic. Preplacement physical examinations should give particular attention to allergic and chronic skin lesions, eye disease, psoriasis, chronic eczematous dermatitis, hyperpigmentation of the skin, keratosis and warts, baseline weight, baseline blood and hemoglobin counts, baseline urinary arsenic determinations.

Annual physical examinations should give attention to general health, weight, skin condition, and any evidence of excessive exposure or absorption of arsenic.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Grey, shiny, brittle, metallic-looking rhombohedral crystals. Can be heated to burn in air with a bluish flame, giving off an odor of garlic and dense white fumes of arsenic trioxide. Loses its luster on exposure to air. Converted by nitric acid or hot sulfuric acid into arsenous or arsenic acid.

Brinell hardness: 147

Mohs' scale: 3.5

**Physical State:** Divided solid

**Vapor Pressure (kPa):** Not applicable

**Vapor Density (Air=1):** Not applicable

**Formula Weight:** 74.92

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 5.73

**Evaporation Rate:** Not applicable

**pH:** Not applicable

**pH (1% Solution):** Not applicable

**Boiling Point:** Sublimes

**Freezing/Melting Point:** 817 °C (1502.6 °F) at 28 atm

**Volatile Component (% Vol):** Not applicable

**Water Solubility:** Insoluble

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Contact with acids liberates toxic gases. Presence of heat source and ignition source.

Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from oxidizing agents, halogens.

Contact with acids produces toxic fumes.

## Section 11 - Toxicological Information

### Toxicity

Oral (man) TD<sub>Lo</sub>: 7857 mg/kg/55 years

Oral (rat) LD<sub>50</sub>: 763 mg/kg

Tumorigenic - Carcinogenic by RTECS criteria.

### Irritation

Nil reported

See RTECS CG 0525000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** Food chain concentration potential: Bioaccumulated by fresh water and marine aquatic organisms

**BCF:** bioaccumulated by aquatic organisms

**Biochemical Oxygen Demand (BOD):** none

## Section 13 - Disposal Considerations

**Disposal:** Follow all federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Arsenic

**ID:** UN1558

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP2, IP4

**Packaging:** Exceptions: None      **Non-bulk:** 212      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 25 kg      **Cargo aircraft only:** 100 kg

**Vessel Stowage:** Location: A      **Other:**



## Section 15 - Regulatory Information

### **EPA Regulations:**

**RCRA 40 CFR:** Listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# Cadmium



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

53/60

**Material Name:** Cadmium

**CAS Number:** 7440-43-9

**Chemical Formula:** Cd

**EINECS Number:** 231-152-8

**ACX Number:** X1002486-9

**Synonyms:** C I 77180; C.I. 77180; CADMIUM; CADMIUM DUST FUME; CADMIUM POWDER; COLLOIDAL CADMIUM; KADMIUM

**Derivation:** Cadmium is collected as dust or fume from roasting zinc ores, mixed with coal or coke and sodium or zinc chloride, and sintered. The cadmium fume is collected in an electrostatic precipitator, leached, fractionally precipitated, and distilled; collected as sludge from zinc sulfate purification; prepared from direct distillation of cadmium-bearing zinc; obtained by recovery from electrolytic zinc process; may be prepared from cadmium sulfate in the laboratory.

**General Use:** Cadmium is used as a constituent of easily fusible alloys; soft solder and solder for aluminum; in electroplating; as a deoxidizer for nickel plating; for process engraving; electrodes for cadmium vapor lamps; photoelectric cells; photometry of ultraviolet sun-rays; in Ni-Cd storage batteries; to charge Jones reducers; as an amalgam in dentistry; power transmission wire; TV phosphors; basis of pigments used in ceramic glazing, machinery enamels, baking enamels; Weston-standard-cell control of atomic fission in nuclear reactors; reactor control rods; fungicide; photography and lithography; selenium rectifiers.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Cadmium		ca 99.5+% wt

**Trace Impurities:** < 10 ppm

### OSHA PEL

TWA: 0.005 mg/m<sup>3</sup>.

### NIOSH REL

Lowest Feasible Concentration.

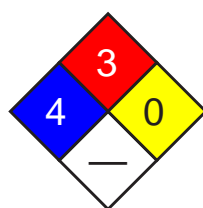
### ACGIH TLV

TWA: 0.01 mg/m<sup>3</sup>; measured as inhalable fraction of the aerosol;  
 TWA: 0.002 mg/m<sup>3</sup>; measured as respirable fraction of the aerosol.

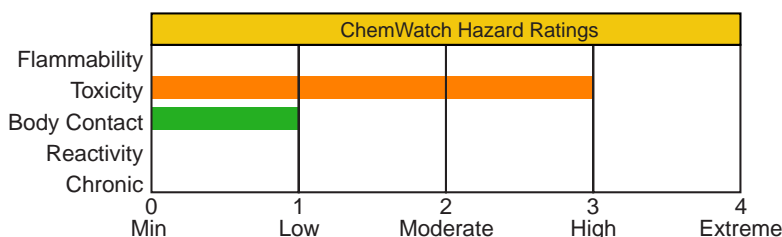
### IDLH Level

9 mg/m<sup>3</sup> (as Cd).

## Section 3 - Hazards Identification

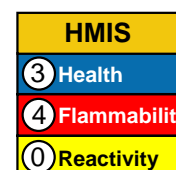


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ANSI Signal Word

**Danger!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Lustrous metal solid, silver-white to bluish color; odorless. Irritating to skin/respiratory tract. Toxic by inhalation. Chronic Effects: kidney damage, obstructive lung disease, possible carcinogen/teratogen. Dust ignites spontaneously in air. Forms explosive dust-air mixtures.

### Potential Health Effects

**Target Organs:** Respiratory system, kidneys

**Primary Entry Routes:** Inhalation and ingestion

**Acute Effects**

**Inhalation:** Initial signs/symptoms of cadmium poisoning resemble those of the flu. Inhalation of dust or fumes causes throat dryness, cough, headache, vomiting, chest pain, dyspnea (shortness of breath), central nervous system (CNS) effects, extreme restlessness and irritability, pneumonitis, possibly bronchopneumonia, pulmonary edema, and death due to respiratory failure in severe cases. Symptoms may be delayed up to 24 hours. Residual emphysema and fibrosis may result. Note: heating of cadmium may produce cadmium oxide, the inhalation of which can result in metal fume fever, characterized by fever, chills, malaise, headache, myalgias, fatigue, cough, thirst, and abdominal discomfort, with symptom onset about 3 to 10 hours after exposure. Symptoms do not usually last beyond 24 to 48 hours.

**Eye:** May cause irritation.

**Skin:** Contact may cause irritation, skin eruptions and pruritus. Significant dermal absorption rarely occurs.

**Ingestion:** Causes increased salivation, dry mouth, choking, nausea, vomiting, abdominal pain and cramping, blurred vision, anemia, kidney dysfunction, diarrhea, gastroenteritis, and substernal pain.

**Carcinogenicity:** NTP - Class 2A, Reasonably anticipated to be a carcinogen, limited evidence of carcinogenicity from studies in humans; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class B1, Probable human carcinogen based on epidemiologic studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

**Medical Conditions Aggravated by Long-Term Exposure:** Kidney disorders, respiratory disorders.

**Chronic Effects:** Include chronic obstructive lung disease such as emphysema, kidney damage (renal tubular disorder and proteinuria (low molecular weight)), bone demineralization, microfractures and osteomalacia, respiratory cancer, gastrointestinal symptoms, anosmia (loss of sense of smell), rhinitis and discoloration of the teeth. It is implicated as the causative agent in Itai- Itai disease in Japan.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation persist.

**Skin Contact:** Quickly remove contaminated clothing. Rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the conscious and alert person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Consider a chest X-ray after acute exposure.

See  
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### Section 5 - Fire-Fighting Measures

**Flash Point:** Data not found.

**Autoignition Temperature:** 482 °F (250 °C) (layer cadmium metal dust)

**LEL:** Data not found.

**UEL:** Data not found.

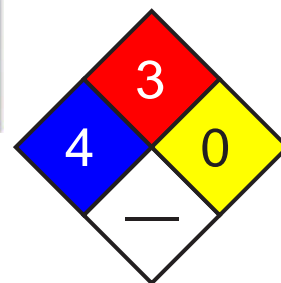
**Flammability Classification:** Flammable

**Extinguishing Media:** Extinguish with carbon dioxide, dolomite, dry powder, graphite, soda ash, sodium chloride, dry chemical, or sand.

**General Fire Hazards/Hazardous Combustion Products:** When heated to decomposition, toxic fumes of cadmium are emitted. The finely divided material is pyrophoric. The more finely divided the powder the greater the fire/explosion hazard.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

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### Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Cleanup personnel should protect against exposure. Prevent entry into water, sewers, basements or confined areas.

**Small Spills:** If in solid form, do not sweep! Absorb or cover with dry earth, sand or other noncombustible material. Carefully scoop up or vacuum (with a HEPA filter).

**Large Spills:** Do not release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120). Also 1910.1027 .

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## Section 7 - Handling and Storage

**Handling Precautions:** Wear personal protective clothing and equipment to prevent dust inhalation and any contact with skin or eyes (Sec. 8). Wash thoroughly after handling cadmium.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed containers in a cool, well-ventilated area away from heat, light, ignition sources, incompatibles, and air. Cadmium slowly oxidizes in air to form cadmium oxide.

**Storage Requirements:** Areas where cadmium is used or stored must be labeled according to 29 CFR 1910.1027.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Where feasible, enclose operations to avoid dust dispersion into the work area. Provide general or local exhaust ventilation systems to maintain airborne concentrations below exposure limits (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Educate workers about the health and safety hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on kidney functions (including urine screening for micro-globulins), lungs and blood. Follow written procedures set forth by OSHA in 29 CFR 1910.1027.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent any skin contact. Butyl rubber, chlorinated polyethylene, and polyvinyl chloride are recommended materials. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not protective eye devices. Appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select respirator based on exposure range as follows. Exposure range  $>0.005$  to  $0.05 \text{ mg/m}^3$  use air purifying respirator, negative-pressure, half-mask;  $>0.05$  to  $0.5 \text{ mg/m}^3$  use air purifying respirator, negative-pressure, full-face;  $>0.5$  to  $5 \text{ mg/m}^3$  use supplied-air respirator, constant flow/pressure-demand, full-face;  $>5 \text{ mg/m}^3$  use a SCBA, pressure-demand, full-face. Use a magenta cartridge (P100). For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, cartridge change schedules, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Silver-white, blue-tinged. Odorless.

**Physical State:** Solid; lustrous metal or granular powder

**Vapor Pressure (kPa):** 1 mm Hg at  $741^\circ\text{F}$  ( $394^\circ\text{C}$ )

**Formula Weight:** 112.41

**Density:** 8.642 at  $77^\circ\text{F}$  ( $25^\circ\text{C}$ )

**Refractive Index:** 1.8 at 578 nm and  $20^\circ\text{C}$

**Boiling Point:**  $1409^\circ\text{F}$  ( $765^\circ\text{C}$ )

**Freezing/Melting Point:**  $609.8^\circ\text{F}$  ( $321^\circ\text{C}$ )

**Ionization Potential (eV):** 8.99367 eV

**Water Solubility:** Insoluble

**Other Solubilities:** Dissolved by acids; ammonium nitrate solution

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Cadmium is stable at room temperature in closed containers under normal storage and handling conditions. It slowly oxidizes in air to form cadmium oxide. Finely divided material is pyrophoric, i.e., it may ignite or explode spontaneously in air. Hazardous polymerization cannot occur. Avoid creation of dust clouds, contact with chemical incompatibles, heat, and sources of ignition.

**Storage Incompatibilities:** Include acids (reacts readily with dilute nitric acid, slowly with hydrochloric acid); explodes on contact with hydrazoic acid; violent or explosive reaction when heated with ammonium nitrate; tellurium; zinc; ammonia; sulfur; selenium; nitryl fluoride; oxidizing agents; metals.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of cadmium can produce toxic fumes of cadmium and cadmium oxide.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 2330 mg/kg.

Mouse, oral, LD<sub>50</sub>: 890 mg/kg.

### Acute Inhalation Effects:

Rat, inhalation, LC<sub>50</sub>: 25 mg/m<sup>3</sup>/30 minutes produced dyspnea.

Human, inhalation, LC<sub>Lo</sub>: 39 mg/m<sup>3</sup>/20 minutes produced cardiac changes; respiratory depression.

### Acute Skin Effects:

Rabbit, subcutaneous, LD<sub>Lo</sub>: 6 mg/kg produced toxic effects: Effects on newborn - reduced weight gain and behavioral.

### Other Effects:

Reproductive Effects: Rat, female, oral, 23 mg/kg administered on gestational days 1 - 22 produced specific developmental abnormalities - blood and lymphatic system (including spleen and marrow).

Rat, female, oral, 21.5 mg/kg administered to multigenerations produced toxic effects: Effects on fertility - preimplantation mortality; Effects on newborn - germ cell effects in offspring.

Rat, male, oral, 155 mg/kg administered 13 weeks prior to mating produced toxic effects: Effects on newborn - reduced weight gain and behavioral.

Mouse, micronucleus test, cell type - embryo: 6 µmol/L induced mutation.

Hamster, cytogenic analysis, cell type - ovary: 1 µmol/L induced mutation.

Tumorigenic Effects - Woman, inhalation, 129 µg/m<sup>3</sup>/20 years, continuous produced toxic effects: carcinogenic by RTECS criteria; Lung, thorax or respiration - tumors.

Human, inhalation, TC<sub>Lo</sub>: 88 µg/m<sup>3</sup>/8.6 years produced proteinuria.

Rat, oral, 546 mg/kg administered for 26 weeks continuously produced toxic effects: changes in serum composition; transaminases; weight loss or decreased weight gain.

Rat, oral, 1512 mg/kg administered for 48 weeks continuously produced toxic effects: changes to liver, kidneys, ureter and bladder.

Rat, subcutaneous, 3372 µg/kg produced toxic effects: carcinogenic by RTECS criteria, tumors at site of application.

See RTECS EU9800000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** *Dreissena polymorpha*, zebra mussels, chronic LC<sub>50</sub>: 130 mcg/L; *Rivulus marmoratus*, mangrove fish, LC<sub>50</sub> in fresh water: 2.96 mg/L; Steelhead trout, LC<sub>50</sub>: 0.0009 ppm for 96 hours; *Daphnia magna*, 0.1 ppm lethal.

## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Cadmium compounds

**ID:** UN2570

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB7, IP1

**Packaging:** Exceptions: None      **Non-bulk:** 211      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 5 kg      **Cargo aircraft only:** 50 kg

**Vessel Stowage:** Location: A      **Other:**



**Shipping Name and Description:** Cadmium compounds**ID:** UN2570**Hazard Class:** 6.1 - Poisonous materials**Packing Group:** II - Medium Danger**Symbols:****Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B***Special Provisions:** IB8, IP2, IP4**Packaging:**      **Exceptions:** None      **Non-bulk:** 212      **Bulk:** 242**Quantity Limitations:**    **Passenger aircraft/rail:** 25 kg      **Cargo aircraft only:** 100 kg**Vessel Stowage:**      **Location:** A      **Other:****Shipping Name and Description:** Cadmium compounds**ID:** UN2570**Hazard Class:** 6.1 - Poisonous materials**Packing Group:** III - Minor Danger**Symbols:****Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B***Special Provisions:** IB8, IP3**Packaging:**      **Exceptions:** 153    **Non-bulk:** 213      **Bulk:** 240**Quantity Limitations:**    **Passenger aircraft/rail:** 100 kg      **Cargo aircraft only:** 200 kg**Vessel Stowage:**      **Location:** A      **Other:**

### Section 15 - Regulatory Information

**EPA Regulations:****RCRA 40 CFR:** Listed**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 10 lb (4.535 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# **Coal Tar Creosote**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

**50/60**

**Material Name:** Coal Tar Creosote

**CAS Number:** 8001-58-9

**Chemical Formula:** No data found.

**EINECS Number:** 232-287-5

**ACX Number:** X1002891-0

**Synonyms:** AWWA #1; BRICK OIL; COAL TAR CREOSOTE; COAL TAR CRESOTE; COAL TAR OIL; CREOSOTE; CREOSOTE OIL; CREOSOTE P1; CREOSOTE, FROM COAL TAR; CREOSOTUM; CRESYLIC CREOSOTE; DEAD OIL; EPA PESTICIDE CHEMICAL CODE 025004; HEAVY OIL; HODGSONS CREOSOTE; LIQUID PITCH OIL; NAPHTHALENE OIL; PRESERV-O-SOTE; SAKRESOTE 100; TAR OIL; WASH OIL

**Derivation:** By distillation of coal tar produced by high-temperature carbonization of bituminous coal; by mixing strained naphthalene oil, wash oil, and strained or light anthracene oil; as a by-product of conventional coal coking.

**General Use:** Used mainly as a wood preservative for railroad ties, poles, fence posts, marine pilings, and other lumber for outdoor use; as a water-proofing agent, fuel oil constituent, frothing agent for mineral separation, tap hole refractory cement, and lubricant for die molds. Used only in limited quantities as an animal and bird repellent, animal dip, and insecticide (ovicide).

## Section 2 - Composition / Information on Ingredients

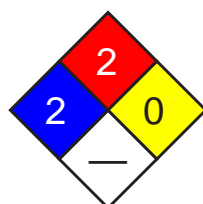
Name	CAS	%
Coal tar creosote	8001-58-9	Consists of aromatic hydrocarbons, anthracene, naphthalene, and phenanthrene derivatives; some tar acids; and tar bases. Polycyclic aromatic hydrocarbons make up at least 75%. * Creosote contains several carcinogenic polycyclic aromatic hydrocarbons including benz[a]anthracene, benzo[a]pyrene, and dibenz[a,h]anthracene.

**OSHA PEL**

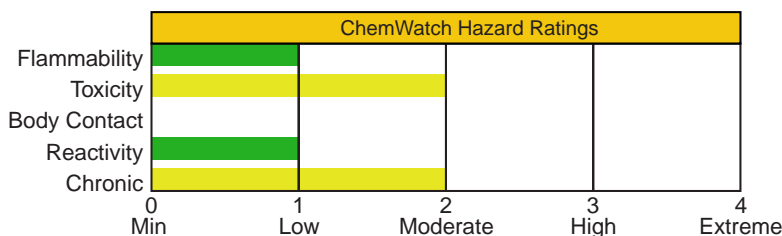
**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
3	Health
2	Flammability
0	Reactivity

**ANSI Signal Word**

**Warning!**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless (pure) or yellow to black (industrial) liquid; aromatic smoky smell. Severely irritating to eyes/skin/respiratory tract. Probable human carcinogen. Combustible.

### Potential Health Effects

**Target Organs:** Eyes, skin, bladder, kidneys, and respiratory system

**Primary Entry Routes:** Inhalation, skin absorption, and skin and/or eye contact

**Acute Effects** *Note! Phenol and phenolic derivatives of various aromatic hydrocarbons (tar acids), present in low concentrations, are the constituents most likely to be responsible for acute toxicity.*

**Inhalation:** Inhalation of vapors causes moderate irritation to the nose, throat, and upper respiratory tract.

**Eye:** Contact with liquid causes conjunctivitis (inflammation of the eye's lining), keratitis (corneal inflammation), or corneal burns with scarring. May cause loss of vision.

**Skin:** Contact causes irritation, burning, itching, redness, pigment changes, dermatitis (a rash of redness and bumps), or burns. Photosensitization (worsening of rash with exposure to sunlight) may occur.



**Ingestion:** Causes salivation, nausea; vomiting; gastrointestinal tract irritation or bleeding; abdominal pain; rapid, thready pulse; vertigo; headaches; loss of pupillary reflexes; hypothermia; cyanosis; respiratory distress; shock and mild convulsions. Large doses may be fatal.

**Carcinogenicity:** NTP - Not listed; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B1, Probable human carcinogen based on epidemiologic studies; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Skin disorders.

**Chronic Effects:** Include dermatitis and, possibly, skin cancer or other forms of cancer. An increased risk of scrotal cancer for creosote-exposed brick makers was indicated in a worker mortality analysis. Epidemiological studies of coke oven workers reveal increased incidences of lung, bladder, prostate, pancreas, and intestinal cancer.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air, monitor for respiratory distress, and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician or ophthalmologist immediately.

**Skin Contact:** *Quickly* remove contaminated clothing. Prior to washing and if readily available, use undiluted polyethylene glycol 300 to 400. Wash affected area with soap and flooding amounts of water for at least 15 min. *Do not* rub or apply pressure to the affected skin, apply any oily substance or use hot water to rinse. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Rinse the mouth several times with cold water. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water. *Do not induce vomiting!* Keep victim warm and at rest.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** Creosote may be detected in urine.

**Special Precautions/Procedures:** An exposed person should examine their skin periodically for growths, changes in warts or moles, and sores that do not heal.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** 165.2 °F (74 °C), Closed Cup

**Autoignition Temperature:** 637 °F (336 °C)

**LEL:** None reported.

**UEL:** None reported.

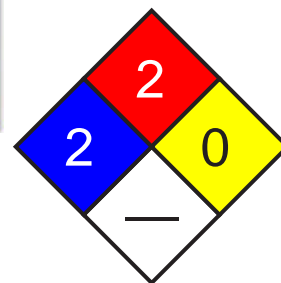
**Flammability Classification:** OSHA IIIA combustible liquid

**Extinguishing Media:** For small fires, use dry chemical, carbon dioxide, water spray or regular foam. For large fires, use water spray, fog or regular foam.

**General Fire Hazards/Hazardous Combustion Products:** Include carbon oxides. Coal tar creosote may present a vapor explosion hazard indoors, outdoors, and in sewers. Vapors may travel to an ignition source and flash back.

**Fire-Fighting Instructions:** If feasible and without undue risk, remove containers from fire hazard area. Otherwise use water spray to cool fire-exposed containers until well after they are extinguished. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Immediately leave area if you hear a rising sound from venting safety device or notice any fire-caused tank discoloration as a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Isolate area for 1/2 mile in all directions if fire involves tank, rail car or tank truck. Fully decontaminate or properly dispose of personal protective clothing.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel. Isolate hazard area, deny entry, and stay upwind of spills. Shut off all ignition sources. Cleanup personnel should protect against vapor inhalation and skin and eye contact.

**Small Spills:** Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal.

**Large Spills:** Consider initial downwind evacuation for at least 300 meters (1000 feet). For large spills, dike far ahead of liquid spill for later disposal. Water spray may reduce vapor. *Do not* release into sewers or waterways. Use nonsparking tools during clean-up.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG



## Section 7 - Handling and Storage

**Handling Precautions:** Avoid vapor inhalation and skin and eye contact. Use ventilation sufficient to reduce airborne exposures to nonhazardous levels (Sec. 2). Wear protective gloves, goggles, and clothing to avoid contact. Wear respiratory protection when necessary (Sec. 8). Consult your industrial hygienist. Practice good personal hygiene procedures to avoid inadvertently ingesting this material. Keep away from ignition sources.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in a cool, dry, well-ventilated area away from heat and ignition sources. Store coal tar creosote as close to area of use as possible to minimize transporting distance. Avoid physical damage to containers.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Enclose all operations and/or ventilate at the site of release to avoid vapor dispersion into the work area. To prevent static sparks, electrically ground and bond all containers and equipment. Provide general or local exhaust ventilation systems equipped with high-efficiency particulate filters to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Preplacement and periodic medical examinations of exposed workers emphasizing respiratory, skin, liver, and kidney disorders, including comprehensive work and medical history, physical examination, CXR, PFTs, urinalysis, LFT, and sputum cytology as the attending physician considers appropriate. Educate workers about the health and safety hazards associated with coal tar creosote.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent any skin contact. With breakthrough times of >8 hr, butyl rubber, Teflon, and Viton are recommended materials. Frequent change of protective garments is an additional protective measure. Wear protective eyeglasses or chemical safety goggles and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. (The following respirator recommendations are for coal tar pitch volatiles.) For concentrations above the NIOSH REL or at any detectable concentrations, wear a SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode; or any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless (pure) or yellow to black (industrial); aromatic smoky smell.

**Physical State:** Oily liquid

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.07 to 1.08 at 68 °F (20 °C)

**Boiling Point:** 381 to 752 °F (194 to 400 °C)

**Water Solubility:** Slightly soluble

**Other Solubilities:** Soluble in alcohol; ether; glycerin; dimethyl sulfate; fixed or volatile oils; in solution of fixed alkali hydroxides.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Coal tar creosote is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Avoid excessive heat and contact with chlorosulfonic acid.

**Storage Incompatibilities:** Creosote oil mixed with chlorosulfonic acid in a closed container causes an increase in temperature and pressure.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of coal tar creosote can produce carbon oxides and thick, black, acrid smoke.

## Section 11 - Toxicological Information

**Acute Oral Effects:**Rat, oral, LD<sub>50</sub>: 725 mg/kg.Mouse, oral, LD<sub>50</sub>: 433 mg/kg.**Other Effects:**

Tumorigenicity, mouse, oral: 2 g/kg administered on gestational days 5-9 produced maternal effects and fetotoxicity.

Reproductive Effects - Hamster, ovary cell: 10 mg/L induced sister chromatid exchange.

Tumorigenicity: Mouse, skin, 99 g/kg/33 weeks administered intermittently produced tumors on skin and appendages (carcinogenic by RTECS criteria).

*S. typhimurium*: 20 µg/plate (-S9) produced mutations.

See RTECS GF8615000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.**Ecotoxicity:** TL50, goldfish (*Carassius auratus*), 3.51 ppm/24 hr (60:40) mixture of creosote and coal tar; TL50, rainbow trout (*Salmo gairdneri*), 3.72 ppm/24 hr (60:40) mixture of creosote and coal tar; LD<sub>50</sub>, bob white quail (*Colinus virginianus*), 1,260 ppm/8 days (60:40) mixture of creosote and coal tar.**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 1.0

## Section 13 - Disposal Considerations

**Disposal:** Coal tar creosote is a good candidate for rotary kiln and fluidized bed incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Handle empty containers carefully as hazardous residues may still remain.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.**Shipping Name and Description:** Corrosive liquids, n.o.s.**ID:** UN1760**Hazard Class:** 8 - Corrosive material**Packing Group:** I - Great Danger**Symbols:** G - Technical Name Required**Label Codes:** 8 - Corrosive**Special Provisions:** A7, B10, T14, TP2, TP27**Packaging:** Exceptions: None      **Non-bulk:** 201      **Bulk:** 243**Quantity Limitations:** Passenger aircraft/rail: 0.5 L      **Cargo aircraft only:** 2.5 L**Vessel Stowage:** Location: B      **Other:** 40**Shipping Name and Description:** Corrosive liquids, n.o.s.**ID:** UN1760**Hazard Class:** 8 - Corrosive material**Packing Group:** II - Medium Danger**Symbols:** G - Technical Name Required**Label Codes:** 8 - Corrosive**Special Provisions:** B2, IB2, T11, TP2, TP27**Packaging:** Exceptions: 154      **Non-bulk:** 202      **Bulk:** 242**Quantity Limitations:** Passenger aircraft/rail: 1 L      **Cargo aircraft only:** 30 L**Vessel Stowage:** Location: B      **Other:****Shipping Name and Description:** Corrosive liquids, n.o.s.**ID:** UN1760**Hazard Class:** 8 - Corrosive material**Packing Group:** III - Minor Danger**Symbols:** G - Technical Name Required**Label Codes:** 8 - Corrosive

**Special Provisions:** IB3, T7, TP1, TP28**Packaging:**      **Exceptions:** 154   **Non-bulk:** 203   **Bulk:** 241**Quantity Limitations:**   **Passenger aircraft/rail:** 5 L      **Cargo aircraft only:** 60 L**Vessel Stowage:**      **Location:** A      **Other:**

### Section 15 - Regulatory Information

**EPA Regulations:****RCRA 40 CFR:** Not listed**CERCLA 40 CFR 302.4:** Not listed**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

**Copper**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Copper

**CAS Number:** 7440-50-8

**Chemical Formula:** Cu

**Structural Chemical Formula:** Cu

**EINECS Number:** 231-159-6

**ACX Number:** X1002511-7

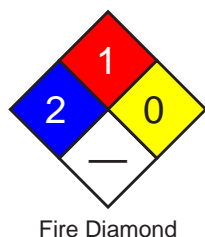
**Synonyms:** ALLBRI NATURAL COPPER; ANAC 110; ARWOOD COPPER; BRONZE POWDER; C.I. 77400; C.I. PIGMENT METAL 2; CDA 101; CDA 102; CDA 110; CDA 122; CE 1110; COPPER; COPPER BRONZE; COPPER M 1; COPPER METAL DUSTS; COPPER METAL FUMES; COPPER POWDER; COPPER SLAG-AIRBORNE; COPPER SLAG-MILLED; COPPER-AIRBORNE; COPPER, METALLIC POWDER; COPPER-MILLED; CU M3; CUPRUM; E 115 (METAL); EPA PESTICIDE CHEMICAL CODE 022501; 1721 GOLD; GOLD BRONZE; KAFAR COPPER; M 1; M 3; M 4; M1 (COPPER); M2 (COPPER); M3 (COPPER); M3R; M3S; M4 (COPPER); OFHC CU; RANEY COPPER

**General Use:** Manufacture of bronzes, brass, other copper alloys, electrical conductors, ammunition, copper salts, works of art, catalyst, oxygen scavenger.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
copper	7440-50-8	>99
<b>OSHA PEL</b> TWA: 1 mg/m <sup>3</sup> .	<b>NIOSH REL</b> TWA: 1 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> TWA: 1 mg/m <sup>3</sup> ; PEAK: 2 mg/m <sup>3</sup> ; measured as inhalable fraction of the aerosol.
<b>ACGIH TLV</b> TWA: 0.2 mg/m <sup>3</sup> ; fume, as Cu; TWA: 1 mg/m <sup>3</sup> ; dusts and mists, as Cu.	<b>IDLH Level</b> 100 mg/m <sup>3</sup> (as Cu).	

## Section 3 - Hazards Identification



	ChemWatch Hazard Ratings				
Flammability					
Toxicity					
Body Contact					
Reactivity					
Chronic					
	0	1	2	3	4
	Min	Low	Moderate	High	Extreme

HMIS	
2	Health
0	Flammability
0	Reactivity

ANSI Signal Word

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Red/brown-colored powder; odorless. Irritating. Other Acute Effects: skin discoloration, nausea, vomiting, abdominal pain, diarrhea, metal fume fever. Chronic Effects: respiratory disease, dermatitis.

### Potential Health Effects

**Target Organs:** respiratory system, skin, eyes, liver, kidneys

**Primary Entry Routes:** inhalation, ingestion

#### Acute Effects

**Inhalation:** The dust may be discomforting to the upper respiratory tract.

Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

Copper poisoning following exposure to copper dusts and fume may result in headache, cold sweat and weak pulse. Capillary, kidney, liver and brain damage are the longer term manifestations of such poisoning. Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.

Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.

Nasal ulcerations with resultant nose-bleed may occur following inhalation of fine dusts.

**Eye:** Particulate/dust is regarded as discomforting and abrasive to the eyes.

**Skin:** The material may be slightly discomforting and abrasive to the skin.

**Ingestion:** The material may be mildly discomforting to the gastrointestinal tract if swallowed in large quantity.

Large oral doses may cause nausea, vomiting, abdominal pain, metallic taste and diarrhea. If vomiting does not occur immediately, systematic copper poisoning may occur; capillary damage, headache, cold sweat, weak pulse, kidney and liver damage may be the result of poisoning.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Chronic Effects:** Chronic exposure to copper dusts may result in runny nose, irritation of mucous membranes and atrophic changes with resultant dementia.

Pre-existing skin, kidney, liver and pulmonary disorders may be aggravated by exposure.

Chronic copper poisoning is rarely recognized in man although in one instance, at least, symptoms more commonly associated with exposures to mercury, namely infantile acrodynia (pink disease), have been described.

Tissue damage of mucous membranes may follow chronic dust exposure.

A hazardous situation is exposure of a worker with the rare hereditary condition (Wilson's disease or hereditary hepatolenticular degeneration) to copper exposure which may cause liver, kidney, CNS, bone and sight damage and is potentially lethal.

Hemolytic anemia (a result of red-blood cell damage) is common in cows and sheep poisoned by copper derivatives.

Overdosing of copper feed supplements has resulted in pigmentary cirrhosis of the liver.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Copper, magnesium, aluminum, antimony, iron, manganese, nickel (and their compounds) in welding, galvanizing or smelting operations all give rise to thermally produced particulates of smaller dimension than might be produced if the metals are divided mechanically. Where insufficient ventilation or respiratory protection is available these particulates may produce "metal fume fever" in the worker.

1. Onset occurs in 4-6 hours generally on the evening following exposure.

Tolerance develops in workers but may be lost over the weekend. (Monday Morning Fever).

2. Pulmonary function tests may indicate reduced lung volumes, small airway obstruction and decreased carbon monoxide diffusing capacity but these abnormalities resolve after several months.

3. Although mildly elevated urinary levels of heavy metal may occur they do not correlate with clinical effects.

4. The general approach to treatment is recognition of the disease, supportive care and prevention of exposure.

5. Seriously symptomatic patients should receive chest x-rays, have arterial blood gases determined and be observed for the development of tracheobronchitis and pulmonary edema.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Noncombustible, except as a powder

**Autoignition Temperature:** Not applicable

**Extinguishing Media:** Sand, dry powder extinguishers or other inerts should be used to smother dust fires.

These are the only suitable means for extinguishing metal dust fires.

Do NOT use water.

**General Fire Hazards/Hazardous Combustion Products:** Does not burn.

Metal powders, while generally regarded as noncombustible, may burn when metal is finely divided and energy input is high. Metal dust fires are slow moving but intense and difficult to extinguish. DO NOT disturb burning dust. Explosion may result if dust is stirred into a cloud, by providing oxygen to a large surface of hot metal. DO NOT use water or foam as generation of explosive hydrogen may result.

**Fire Incompatibility:** Avoid contact with acetylene, ammonium nitrate, barium bromate, chlorate and iodate, bromates, phosphorus, potassium chlorate, potassium iodate, potassium peroxide, sodium azide, sodium chlorate and iodate, sodium peroxide, sulfur and chlorates.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

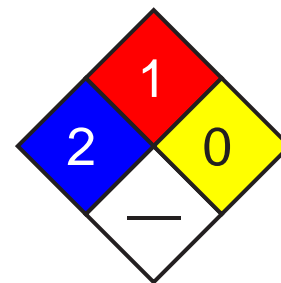
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Cool fire-exposed containers with water spray from a protected location.

Do not approach containers suspected to be hot.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear impervious gloves and safety glasses.

Use dry clean-up procedures and avoid generating dust.

Vacuum up or sweep up.

Place spilled material in clean, dry, sealable, labeled container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Control personal contact by using protective equipment and dust respirator.

Prevent spillage from entering drains, sewers or waterways.

Avoid generating dust. Sweep, shovel up. Recover product wherever possible.

Put residues in labeled plastic bags or other containers for disposal.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.

Always wash hands with soap and water after handling.

Avoid physical damage to containers. Use good occupational work practices.

Observe manufacturer's storing and handling recommendations.

**Recommended Storage Methods:** Packaging as recommended by manufacturer.

Check that containers are clearly labeled.

Glass container.

Plastic drum.

Polyethylene or polypropylene container.

Metal can.

Metal drum.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage areas.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses; safety glasses with side shields; chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** No special equipment needed when handling small quantities.

OTHERWISE: Wear chemical protective gloves, eg. PVC.

**Respiratory Protection:**

Exposure Range >0.1 to 1 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >1 to 10 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >10 to 100 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range >100 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: magenta (P100)

**Note:** as a fume; if exposure is as a dust, respirator recommendations are different

**Other:** No special equipment needed when handling small quantities.

OTHERWISE: Overalls. Barrier cream. Eyewash unit.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Reddish metallic solid with high electrical conductivity. Odorless.

**Physical State:** Divided solid

**pH (1% Solution):** Not applicable.

**Vapor Pressure (kPa):** 0.13 at 1628 °C

**Boiling Point:** 2595 °C (4703 °F)

**Formula Weight:** 63.5

**Freezing/Melting Point:** 1083 °C (1981.4 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 8.94

**Volatile Component (% Vol):** Not applicable

**Evaporation Rate:** Not applicable

**Decomposition Temperature (°C):** Not applicable

**pH:** Not applicable

**Water Solubility:** Insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid storage with acetylene, ammonium nitrate, bromates, chlorates, chlorine, chlorine plus oxygen difluoride, chlorine trifluoride, ethylene oxide, fluorine, hydrazine, mononitrate, hydrozoic acid, hydrogen peroxide, hydrogen sulfide, iodates, lead azide, phosphorus, nitric acid, potassium peroxide, sodium azide, sodium peroxide, sulfur plus chlorates, and 1-bromo-2-propylene.

## Section 11 - Toxicological Information

**Toxicity**

Oral (human) TD<sub>Lo</sub>: 0.12 mg/kg

**Irritation**

Nil Reported

See RTECS GL 5325000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible or consult manufacturer for recycling options. Follow applicable federal, state, and local regulations.

Bury residue in an authorized landfill.

Recycle containers where possible, or dispose of in an authorized landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** None

## Section 15 - Regulatory Information

**EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed



**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

**DDT**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

42/60

**Material Name:** DDT

**CAS Number:** 50-29-3

**Chemical Formula:** C<sub>14</sub>H<sub>9</sub>Cl<sub>5</sub>

**Structural Chemical Formula:** (ClC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CHCCl<sub>3</sub>

**EINECS Number:** 200-024-3

**ACX Number:** X1002032-1

**Synonyms:** AAVERO-EXTRA; AGRITAN; ANOFEX; ARKOTINE; AZOTOX; AZOTOX M-33; BENZENE,1,1'-(2,2,2-TRICHLOROETHYLIDENE)BIS(4-CHLORO-; 2,2-BIS (P-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE; ALPHA,ALPHA-BIS(P-CHLOROPHENYL)-BETA,BETA,BETA-TRICHLORETHANE; 1,1-BIS(P-CHLOROPHENYL)-2,2,2-TRICHLOROETHANE; 1,1-BIS-(P-CHLOROPHENYL)-2,2,2-TRICHLOROETHANE; 2,2-BIS(P-CHLOROPHENYL)-1,1,1-TRICHLOROETHANE; ALPHA,ALPHA-BIS(P-CHLOROPHENYL)-BETA,BETA,BETA-TRICHLOROETHANE; BOSAN SUPRA; BOVIDERMOL; CHLOFENOTAN; CHLOROPHENOTHAN; CHLOROPHENOTHANE; CHLOROPHENOTOXUM; CHLORPHENOTHAN; CHLORPHENOTOXUM; CITOX; CLOFENOTANE; 4,4'-DDT; DDT; P,P'-DDT; P,P'-DDT; DEDELO; DEOVAL; DETOX; DETOXAN; DIBOVAN; DIBOVIN; 4,4'-DICHLORODIPHENYLTRICHLOROETHANE; DICHLORODIPHENYLTRICHLOROETHANE; P,P'-DICHLORODIPHENYLTRICHLOROETHANE; DICOPHANE; DIDIGAM; DIDIMAC; DIPHENYLTRICHLOROETHANE; DODAT; DYKOL; ENT 1,506; ENT-1506; EPA PESTICIDE CODE 029201; ESTONATE; ETHANE,1,1,1-TRICHLORO-2,2-BIS(4-CHLOROPHENYL)-; ETHANE,1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)-; GENITOX; GESAFID; GESAPON; GESAREX; GESAROL; GUESAPON; GUESAROL; GYRON; HAVERO-EXTRA; HILDIT; IVORAN; IXODEX; KLORFENOTON; KOPSOL; MICRO DDT 75; MUTOXAN; MUTOXIN; NEOCID; NEOCIDOL; NEOCIDOL (SOLID); OMS 0016; OMS 16; PARACHLOROCIDUM; PEB1; PENTACHLORIN; PENTECH; PENTICIDUM; PPZEIDAN; PP'-ZEIDANE; R50; RUKSEAM; SANTOBANE; TAFIDEX; TECH DDT; 1,1,1-TRICHLOR-2,2-BIS(4-CHLOOR FENYL)-ETHAAN; 1,1,1-TRICHLOR-2,2-BIS(4-CHLOR-PHENYL)-AETHAN; 1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE; TRICHLOROBIS(4-CHLOROPHENYL)ETHANE; 1,1,1-TRICHLORO-2,2-DI(4-CHLOROPHENYL)-ETHANE; 1,1,1-TRICHLORO-2,2-DI(4-CHLOROPHENYL)ETHANE; 1,1'-(2,2,2-TRICHLOROETHYLIDENE)BIS(4-CHLOROBENZENE); 1,1,1-TRICLORO-2,2-BIS(4-COLOR-FENIL)-ETANO; 1,1,1-TRICLORO-2,2-BIS(4-COLOR-FENYL)-ETANO; ZEIDANE; ZERDANE

**Derivation:** Prepared by condensing chloral or chloral hydrate with chlorobenzene in presence of sulfuric acid.

**General Use:** One of the most widely used contact insecticides from 1945 until its ban in 1972. Although banned in the U.S. (except for such uses as emergency health situations and for controlling body lice), it is still widely used in the tropics for control of vector-carrying diseases such as malaria, yellow fever, dengue, filariasis, louse-borne typhus, and louse-borne relapsing fever.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
DDT	50-29-3	<i>p,p'</i> DDT 70% wt + <i>o,p'</i> DDT 30% wt (technical grade)

**Trace Impurities:** DDD, DDE

**OSHA PEL**  
 TWA: 1 mg/m<sup>3</sup>; skin.

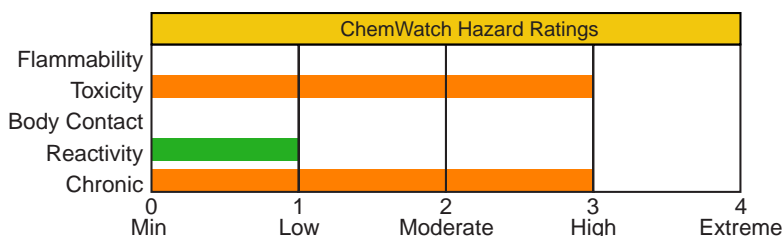
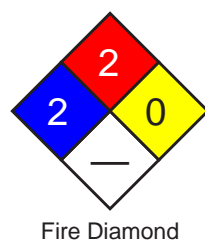
**NIOSH REL**  
 TWA: 0.5 mg/m<sup>3</sup>.

**DFG (Germany) MAK**  
 TWA: 1 mg/m<sup>3</sup>; PEAK: 8 mg/m<sup>3</sup>; skin; measured as inhalable fraction of the aerosol.

**ACGIH TLV**  
 TWA: 1 mg/m<sup>3</sup>.

**IDLH Level**  
 500 mg/m<sup>3</sup>.

## Section 3 - Hazards Identification



HMIS	
2	Health
2	Flammability
0	Reactivity

## ANSI Signal Word

**Caution**☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

White to gray, crystalline solid. Causes: (ingestion of large amounts) CNS effects, possible liver damage. Confirmed animal carcinogen and a suspected human carcinogen.

**Potential Health Effects**

**Target Organs:** Central nervous system, liver, skin, peripheral nervous system.

**Primary Entry Routes:** Inhalation, ingestion, skin contact.

**Acute Effects**

**Inhalation:** Inhalation does not appear to cause toxicity beyond that of minor mechanical irritation.

**Eye:** Exposure to 423 mg/m<sup>3</sup>/1 hr/day for 6 days caused eye irritation.

**Skin:** Skin absorption may occur from some DDT solutions, but degree of absorption will depend on the solvent involved. Aqueous solutions and the powder or crystals are not easily absorbed.

**Ingestion:** DDT can cause a variety of central nervous system effects if ingested. Large doses generally result in vomiting, while smaller doses cause symptoms within 2 to 3 hr post-ingestion. Symptoms include tingling of the lips, tongue, and face; malaise; headache; sore throat; fatigue; tremors of the head, neck, and eyelids; apprehension; ataxia; and confusion. Convulsions and paralysis of the hands is possible in severe exposures (if vomiting does not occur). Vital signs are usually normal, but in severe poisonings, the pulse may be irregular and abnormally slow. Based on animal studies, it is expected that ventricular fibrillation and sudden death can occur at any time during acute poisoning. Recovery from acute poisoning generally occurs within 24 hr except in the most serious cases.

**Carcinogenicity:** NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Possibly, disorders of the central nervous system and liver.

**Chronic Effects:** There are conflicting reports on whether or not DDT produces chronic effects in humans. Although it is well established that chronic exposure in experimental animals produces effects including liver damage, CNS degeneration, dermatitis, weakness, convulsions, coma, and death, these effects are not confirmed in humans. Liver cancer is confirmed in animals, but has not been documented in humans. These conflicting reports appear due to the lack of documented chronic toxicity in workers and data showing that DDT and its metabolites are retained in the body fat for long time periods, thus providing a basis for the *possibility* of chronic toxicity.

**Section 4 - First Aid Measures**

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.


**Skin Contact:** *Quickly* remove contaminated clothing. Rinse away any loose material and wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing because it may pose a fire hazard.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting. Gastric lavage should be performed promptly.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Effects may be delayed; keep under observation. Solvents such as kerosine are added to DDT as a vehicle and, depending on the type involved, may be more toxic than DDT itself.

**Special Precautions/Procedures:** Amobarbital or pentobarbital is recommended for the relief of central neurological manifestations; tribromoethanol and paraldehyde are recommended for allaying prolonged convulsions.



See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** DDT itself is noncombustible but is dissolved in a variety of solvents. The average quoted Flash Point is 162 °F (72.2 °C) (CC) although the specific vehicle is not identified.

**Autoignition Temperature:** None reported

**LEL:** None reported

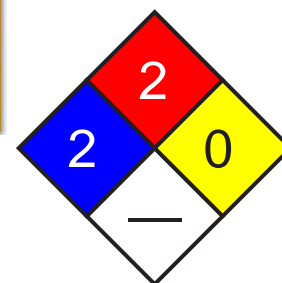
**UEL:** None reported

**Flammability Classification:** Class IIIA Combustible Liquid (varies depending on vehicle)

**Extinguishing Media:** For small fires, use dry chemical, water spray, or regular foam. For large fires, use water spray, fog, or regular foam.

**General Fire Hazards/Hazardous Combustion Products:** Chloride fumes and carbon oxide gases. Container may explode in heat of fire.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Fight fire from maximum distance. Stay away from ends of tanks. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural fire fighters' protective clothing is *not* effective.



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against contamination.

**Small Spills:** For dry spills, carefully scoop up material or vacuum (with an approved filter). Damp mop any residue. For small solution spills, take up with earth, sand, vermiculite, or other absorbent material and place in suitable containers for disposal.

**Large Spills:** Dike far ahead of liquid spill for later reclamation or disposal. Do not release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Use non-sparking tools to open containers. Keep dry chemical extinguishers on hand in case of fire.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). *Do not* store in aluminum or iron containers.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all equipment used with and around DDT. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the liver and central nervous system.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face- protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use a SCBA with a full facepiece and operated in pressure demand or other positive-pressure mode, or any supplied-air respirator with a full facepiece and operated in pressure demand or other positive-pressure mode with an auxiliary SCBA. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** White to gray crystals or powder which is odorless or has a slight aromatic odor.

**Physical State:** Solid

**Odor Threshold:** 5.0725 mg/m<sup>3</sup>

**Vapor Pressure (kPa):** 5.5 x 10<sup>-6</sup> mm Hg at 68 °F (20 °C)

**Formula Weight:** 354.48

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.98 to 0.99

**Boiling Point:** 365 °F (185 °C)

**Freezing/Melting Point:** 227 °F (108.3 °C)

**Water Solubility:** 0.0012 ppm

**Other Solubilities:** (g DDT/100 mL): acetone 58, 95% alcohol 2, benzene 78, benzyl benzoate 42, carbon tetrachloride 45, chlorobenzene 74, cyclohexanone 116, dibutyl phthalate 33, o-dichlorobenzene 68, dichlorodifluoromethane 2, dioxane 100, ethyl ether 28, gasoline 10, isopropanol 3, kerosine 8 to 10, methylated naphthalenes 40 to 60, mineral oil 5, morpholine 75, peanut oil 11, pine oil 0 to 16, tetralin 61, tributyl phosphate 50, and xylene 60.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** DDT is stable at room temperature in closed containers under normal storage and handling conditions. It biodegrades very slowly. Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.

**Storage Incompatibilities:** Strong oxidizers, alkaline materials, iron and aluminum salts.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of DDT can produce carbon dioxide.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 87 mg/kg; details not reported.

Human, oral, LD<sub>Lo</sub>: 500 mg/kg caused convulsions, cardiac arrhythmias, and respiratory changes.

### Other Effects:

Mutagenicity - *E. coli*: 15 µmol/L caused DNA damage.

Teratogenicity - Rat, oral, TD<sub>Lo</sub>: 112 mg/kg given to a 56 day old male caused paternal effects (spermatogenesis, testes, epididymis, sperm duct).

Rat, oral, TD<sub>Lo</sub>: 1225 mg/kg given for 7 continuous weeks caused liver tumors.

See RTECS KJ3325000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** In water, DDT will adsorb strongly to sediments, significantly bioconcentrate in fish, and will be subject to considerable evaporation with an estimated half-life of several hr to almost 50 hr from certain waters. It may biodegrade when high concentrations of required microbes (*Escherichia*, *Hydrogenomonas*, and *Saccharomyces*) are present. On land, DDT will adsorb strongly and should not appreciably leach to groundwater. It may evaporate (half-life of 100 days) and is subject to photooxidation from soil. DDT may significantly biodegrade in flooded soils or under anaerobic conditions provided high populations of the required microbes are present. Half-life ranges from 2 to >15 yr. In the air, DDT is subject to direct photooxidation and reaction with photochemically produced hydroxyl radicals (est. half-life = 2 days). Wet and dry deposition are significant mechanisms for removal from air.

**Ecotoxicity:** Glass shrimp (*Palaemonestes kadiakensis*), LC<sub>50</sub> = 2.3 mcg/L/96 hr at 69.8 °F (21 °C); Japanese quail, 2 month old male, (*Coturnix japonica*), LD<sub>50</sub> = 841 mg/kg; bluegill (*Lepomis macrochirus*), LC<sub>50</sub> = 28.7 mcg/L/36 hr.

## Section 13 - Disposal Considerations

**Disposal:** DDT is a good candidate for rotary kiln or liquid injection incineration (furnace with afterburner and alkali scrubber). 60 to 80% removal of DDT from contaminated soils has been achieved in 10 min. by super critical-carbon dioxide extraction. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Triple rinse containers. Containers in good condition should be returned to the manufacturer and those that are not reusable should be punctured and transported to a scrap metal facility for recycling, disposal, or burial in a designated landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Organochlorine pesticides, solid, toxic

**ID:** UN2761

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB7, IP1

**Packaging:** Exceptions: None      **Non-bulk:** 211      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 5 kg      **Cargo aircraft only:** 50 kg

**Vessel Stowage:** Location: A      **Other:** 40



**Shipping Name and Description:** Organochlorine pesticides, solid, toxic

**ID:** UN2761

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP2, IP4

**Packaging:** Exceptions: None      **Non-bulk:** 212      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 25 kg      **Cargo aircraft only:** 100 kg

**Vessel Stowage:** Location: A      **Other:**



**Shipping Name and Description:** Organochlorine pesticides, solid, toxic

**ID:** UN2761

**Hazard Class:** 6.1 - Poisonous materials

**Packing Group:** III - Minor Danger

**Symbols:**

**Label Codes:** 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB8, IP3

**Packaging:** Exceptions: 153      **Non-bulk:** 213      **Bulk:** 240

**Quantity Limitations:** Passenger aircraft/rail: 100 kg      **Cargo aircraft only:** 200 kg

**Vessel Stowage:** Location: A      **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed U061 Toxic Waste

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1 lb (0.454 kg)

**SARA 40 CFR 372.65:** Listed as Compound

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# **Hydrochloric Acid**



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Hydrochloric Acid

**CAS Number:** 7647-01-0

**Chemical Formula:** ClH

**Structural Chemical Formula:** HCl

**EINECS Number:** 231-595-7

**ACX Number:** X1002202-3

**Synonyms:** 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED

**General Use:** Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.

Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

### OSHA PEL

Ceiling: 5 ppm, 7 mg/m<sup>3</sup>.

### NIOSH REL

Ceiling: 5 ppm, 7 mg/m<sup>3</sup>.

### DFG (Germany) MAK

TWA: 5 ppm; PEAK: 5 ppm.

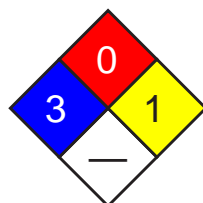
### ACGIH TLV

Ceiling: 2 ppm.

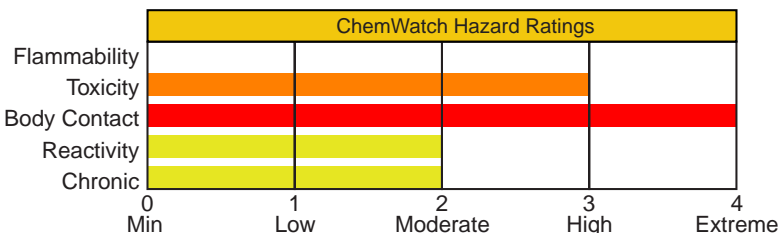
### IDLH Level

50 ppm.

## Section 3 - Hazards Identification



Fire Diamond



### ANSI Signal Word

**Danger!**

HMIS	
2	Health
0	Flammability
0	Reactivity



Corrosive



Compressed Gas

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

### Potential Health Effects

**Target Organs:** eyes, skin, respiratory system, liver (in animals)

**Primary Entry Routes:** inhalation, skin contact, eye contact

#### Acute Effects

**Inhalation:** The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.

Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.

A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.

Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.

High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.

Inhalation hazard is increased at higher temperatures.

The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.

Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

**Eye:** Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.

The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

**Skin:** The material is corrosive to the skin and may cause chemical burns.

Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

The vapor is discomforting to the skin.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.

Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.

Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.

Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

### Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

**Ingestion:** Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

See  
DOT  
ERG

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

**INGESTION:**

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4. Charcoal has no place in acid management.
5. Some authors suggest the use of lavage within 1 hour of ingestion.

**SKIN:**

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2. Deep second-degree burns may benefit from topical silver sulfadiazine.

**EYE:**

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Nonflammable**Autoignition Temperature:** Not applicable**LEL:** Not applicable**UEL:** Not applicable**Extinguishing Media:** Water spray or fog; foam;

Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.

**General Fire Hazards/Hazardous Combustion Products:** Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.

Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

**Fire Incompatibility:** Reacts with metals producing flammable/explosive hydrogen gas.

Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.

Note: Compatibility with plastics should be confirmed prior to use.

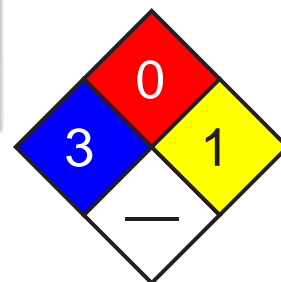
**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use.

Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

See  
DOT  
ERG

**Large Spills:** Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize. Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.

Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.

**WARNING:** To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.

Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.

Keep dry. Reacts violently with water.

Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.

**Recommended Storage Methods:** Packaging as recommended by manufacturer. Check that containers are clearly labeled.

Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. **WARNING:** Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.

Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.

### Personal Protective Clothing/Equipment:

**Eyes:** Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Neoprene gloves; rubber gloves. Nitrile gloves.

Safety footwear. Rubber boots.

Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.

PVC boots or PVC safety gumboots.

### Respiratory Protection:

Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: white

**Other:** Ensure there is ready access to a safety shower; Eyewash unit.

Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.

### Glove Selection Index:

BUTYL ..... Best selection

BUTYL/NEOPRENE ..... Best selection

HYPALON ..... Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

NITRILE+PVC ..... Best selection

PE/EVAL/PE ..... Best selection

SARANEX-23 ..... Best selection

VITON/NEOPRENE ..... Best selection

PVC..... Best selection

NITRILE.....	Best selection
NATURAL RUBBER.....	Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE.....	Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE .....	Poor to dangerous choice for other than short-term immersion

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.

Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

**Physical State:** Hydrogen chloride: Compressed gas;

Hydrochloric acid: Liquid

**Vapor Pressure (kPa):** < 24.8 at 25 °C

**Vapor Density (Air=1):** 1.268 at 20 °C

**Formula Weight:** 36.461

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** < 1.19 at 20 °C

**Evaporation Rate:** Slow

**pH:** Hydrochloric acid: < 1

**Boiling Point:** -85 °C (-121 °F)

**Freezing/Melting Point:** -114.44 °C (-173.992 °F)

**Volatile Component (% Vol):** 100

**Decomposition Temperature (°C):** Not applicable

**Water Solubility:** 56.1 g/100 cc hot water at 60 °C

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid.

Compatibility with plastics should be confirmed prior to use.

Hydrochloric acid: Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

## Section 11 - Toxicological Information

### Toxicity

Inhalation (human) LC<sub>Lo</sub>: 1300 ppm/30 m

Inhalation (human) LC<sub>Lo</sub>: 3000 ppm/5 m

Inhalation (rat) LC<sub>50</sub>: 3124 ppm/60 m

Inhalation (rat) LC<sub>50</sub>: 4701 ppm/30 m

Oral (rat) LD<sub>50</sub>: 900 mg/kg

### Irritation

Eye (rabbit): 5 mg/30 s - mild

See RTECS MW 4025000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** TL<sub>m</sub> Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC<sub>50</sub> Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC<sub>50</sub> Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC<sub>50</sub> Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC<sub>50</sub> Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC<sub>100</sub> Trout 10 mg/l 24 hr /Conditions of bioassay not specified

**Biochemical Oxygen Demand (BOD):** none

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.

Return empty cylinders to supplier.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Hydrogen chloride, anhydrous

**ID:** UN1050

**Hazard Class:** 2.3 - Poisonous gas

**Packing Group:**

**Symbols:**

**Label Codes:** 2.3 - Poison Gas, 8 - Corrosive

**Special Provisions:** 3

**Packaging:** Exceptions: None **Non-bulk:** 304 **Bulk:** None

**Quantity Limitations:** Passenger aircraft/rail: Forbidden **Cargo aircraft only:** Forbidden

**Vessel Stowage:** Location: D **Other:** 40



**Shipping Name and Description:** Hydrochloric acid

**ID:** UN1789

**Hazard Class:** 8 - Corrosive material

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 8 - Corrosive

**Special Provisions:** A3, A6, B3, B15, IB2, N41, T8, TP2, TP12

**Packaging:** Exceptions: 154 **Non-bulk:** 202 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: 1 L **Cargo aircraft only:** 30 L

**Vessel Stowage:** Location: C **Other:**



**Shipping Name and Description:** Hydrochloric acid

**ID:** UN1789

**Hazard Class:** 8 - Corrosive material

**Packing Group:** III - Minor Danger

**Symbols:**

**Label Codes:** 8 - Corrosive

**Special Provisions:** IB3, T4, TP1, TP12

**Packaging:** Exceptions: 154 **Non-bulk:** 203 **Bulk:** 241

**Quantity Limitations:** Passenger aircraft/rail: 5 L **Cargo aircraft only:** 60 L

**Vessel Stowage:** Location: C **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Listed

**RQ:** 5000 lb

**TPQ:** 500 lb

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

**Lead**



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

**54/60**

**Material Name:** Lead **CAS Number:** 7439-92-1  
**Chemical Formula:** Pb  
**Structural Chemical Formula:** Pb  
**EINECS Number:** 231-100-4  
**ACX Number:** X1000227-2  
**Synonyms:** C.I. 77575; C.I. PIGMENT METAL 4; GLOVER; KS-4; LEAD; LEAD FLAKE; LEAD INORGANIC; LEAD METAL; LEAD S2; LEAD SZ; OLOW; OMAHA & GRANT; PB-S 100; PLUMBUM  
**General Use:** Used as a construction material in chemical reaction equipment (tank piping, etc.); manufacture of tetraethyl lead; pigments for paints.  
 Used in pottery glazes, glass, ceramics, bearing metal and alloys, solder and other lead alloys.  
 Also used in metallurgy of steel and other metals, cable sheathing, storage batteries, radiation shielding and ammunition.

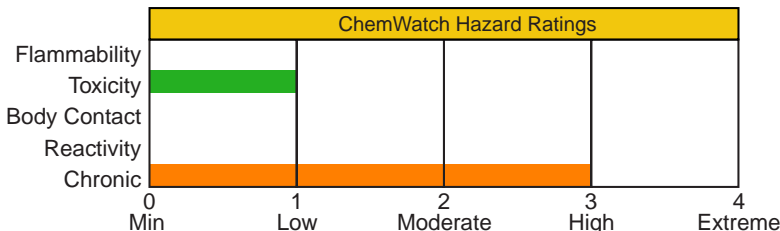
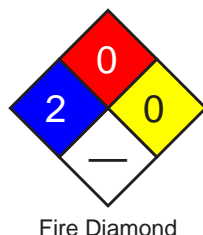
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
lead	7439-92-1	>99

<b>OSHA PEL</b> TWA: 0.05 mg/m <sup>3</sup> ; as Pb inorganic.	<b>NIOSH REL</b> TWA: 0.05 mg/m <sup>3</sup> .  <b>IDLH Level</b> 100 mg/m <sup>3</sup> (as Pb).	<b>DFG (Germany) MAK</b> TWA: 0.1 mg/m <sup>3</sup> ; PEAK: 8 mg/m <sup>3</sup> ; measured as inhalable fraction of the aerosol; Excluding lead arsenate and lead chromate.
<b>ACGIH TLV</b> TWA: 0.05 mg/m <sup>3</sup> .		

## Section 3 - Hazards Identification



HMIS	
3	Health
1	Flammability
0	Reactivity

ANSI Signal Word

**Danger!**



### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white, silvery, or gray metal. Cumulative poison. Chronic Effects: severe neurological effects, blood/kidney damage, sterility, decreased fertility, developmental damage to fetus. Possible cancer hazard.

### Potential Health Effects

**Target Organs:** blood, central nervous system (CNS), peripheral nervous system, kidneys, gastrointestinal (GI) tract

**Primary Entry Routes:** inhalation, ingestion

#### Acute Effects

**Inhalation:** The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.

**Eye:** The dust may be discomforting to the eyes.

**Skin:** The material may be mildly discomforting to the skin.

Prolonged exposure may cause skin reactions.

Skin absorption is not considered a significant route of exposure.

**Ingestion:** The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed.

In rats intestinal lead absorption is bidirectional and does not follow a linear relationship with oral dose.



Acute effects of exposure are generally minor because of its relative insolubility and physical form. Unusual instances of exposure have been reported in inadequately ventilated indoor firing ranges (as fume), in the application of surma, a mascara-like cosmetic agent, to the conjunctival surfaces in Asian countries and in lead-smelting and associated occupations.

In humans lead metabolism fits into a three compartment model. The first compartment in which lead has a half-life of about 35 days includes the blood; it receives blood from the gut and delivers some of it to the urine and communicates with the other two pools. The second compartment in which lead has a similar half-life includes the soft tissues which contain about half the blood level; they share lead with hair, nails, sweat, saliva, bile and other digestive secretions. The skeleton is the third compartment and contains the vast bulk of the total body burden, possesses a very long half-life and demonstrates a difference between the dense and less dense components to bind lead.

**Carcinogenicity:** NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

**Chronic Effects:** Symptoms of exposure include headache, fatigue, sleep disturbances, abdominal pains and decreased appetite. Overexposure to lead in the form of dust has toxic effects on the lungs and kidneys and on the nervous system resulting in mental disturbances and anemia.

Skin absorption is not considered to be a significant route of exposure.

Worker exposure to lead must be kept to a minimum, especially in cases where lead is worked at temperatures whereby lead vapors are evolved e.g. metal refining.

Lead is an accumulative poison and exposure even to small amounts can raise the body's content to toxic levels. Potential adverse effects on the offspring of pregnant workers have been cited in the literature.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Rinse mouth out with plenty of water.

Seek medical attention if irritation or discomfort persist.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** 1. Gastric acids solubilize lead and its salts and lead absorption occurs in the small bowel.

2. Particles of less than 1 µm diameter are substantially absorbed by the alveoli following inhalation.

3. Lead is distributed to the red blood cells and has a half-life of 35 days.

It is subsequently redistributed to soft tissue & bone-stores or eliminated. The kidney accounts for 75% of daily lead loss; integumentary and alimentary losses account for the remainder.

4. Neurasthenic symptoms are the most common symptoms of intoxication.

Lead toxicity produces a classic motor neuropathy.

Acute encephalopathy appears infrequently in adults.

Diazepam is the best drug for seizures.

5. Whole-blood lead is the best measure of recent exposure; free erythrocyte protoporphyrin (FEP) provides the best screening for chronic exposure. Obvious clinical symptoms occur in adults when whole-blood lead exceeds 80 µg/dL.

6. British Anti-Lewisite is an effective antidote and enhances fecal and urinary excretion of lead. The onset of action of BAL is about 30 minutes and most of the chelated metal complex is excreted in 4-6 hours, primarily in the bile.

Adverse reaction appears in up to 50% of patients given BAL in doses exceeding 5 mg/kg. CaNa2EDTA has also been used alone or in concert with BAL as an antidote.

D-penicillamine is the usual oral agent for mobilization of bone lead; its use in the treatment of lead poisoning remains investigational.

2-3-dimercapto-1-propanesulfonic acid (DMPS) and dimercaptosuccinic acid (DMSA) are water soluble analogues of BAL and their effectiveness is undergoing review.

As a rule, stop BAL if lead decreases below 50 µg/dL; stop CaNa2EDTA if blood lead decreases below 40 µg/dL or urinary lead drops below 2 mg/24 hrs.

**BIOLOGICAL EXPOSURE INDEX - BEI**

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
--------------------	--------------	----------------------	-----------------

Lead in blood	50 ug/100 mL	Not Critical	B
Lead in urine	150 ug/gm creatinine	Not critical	B
Zinc Protoporphyrin in blood	250 ug/100 mL erythrocytes OR 100 ug/100 mL blood	After 1 month exposure	B

B: Background levels occur in specimens collected from subjects NOT exposed.

### Section 5 - Fire-Fighting Measures

**Flash Point:** Not available; probably noncombustible

**Autoignition Temperature:** Not applicable

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** There is no restriction on the type of extinguisher which may be used.

**General Fire Hazards/Hazardous Combustion Products:** Noncombustible.

Not considered to be a significant fire risk; however, containers may burn.

Moderate fire hazard, in the form of dust, when exposed to heat or flames.

Decomposition products may include toxic lead dust and lead oxide fumes.

**Fire Incompatibility:** Incompatible with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

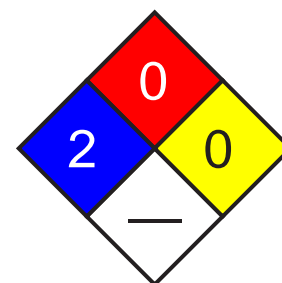
Use fire fighting procedures suitable for surrounding area.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

If safe to do so, remove containers from path of fire.

Cool fire-exposed containers with water spray from a protected location.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

### Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear protective clothing, gloves, safety glasses and dust respirator.

Use dry clean-up procedures and avoid generating dust.

Vacuum up.

Place spilled material in clean, dry, sealable, labeled container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Control personal contact by using protective equipment and dust respirator.

Prevent spillage from entering drains, sewers or waterways.

Recover product wherever possible. Avoid generating dust. Sweep / shovel up.

If required, wet with water to prevent dusting.

Put residues in labeled plastic bags or other containers for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

### Section 7 - Handling and Storage

**Handling Precautions:** Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

**Recommended Storage Methods:** Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved dust respirator.

Correct fit is essential to obtain adequate protection.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious gloves; rubber gloves.

Rubber boots.

Protective footwear.

**Respiratory Protection:**

Exposure Range >0.05 to 0.5 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range >0.5 to 2.5 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Full Face

Exposure Range >2.5 to 50 mg/m<sup>3</sup>: Powered Air Purifying Respirator, Half or Full Facepiece or Hood

Exposure Range >50 to 100 mg/m<sup>3</sup>: Supplied Air Respirator with Full Facepiece, Hood, Helmet, or Suit, operated in a Positive Pressure Mode

Exposure Range >100 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face  
Cartridge Color: magenta (P100)

**Note:** (29CFR 1910.1025) for general industry

**Other:** Overalls. Eyewash unit. Skin cleansing cream.

Provide adequate ventilation in warehouse or closed storage areas.

General and local exhaust ventilation usually required to maintain airborne dust levels to safety levels.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Bluish-white, silvery-gray metal. Malleable, lustrous when freshly cut and tarnishes when exposed to air. Reacts with strong acids like nitric acid, sulphuric or hydrochloric acid. Attacked by water in presence of oxygen. Poor electrical conductor. Lead fumes are formed at temperatures above 500-700 °C.

**Physical State:** Divided solid

**pH:** Not applicable

**Vapor Pressure (kPa):** 0.24 at 1000 °C

**pH (1% Solution):** Not applicable.

**Vapor Density (Air=1):** Not applicable

**Boiling Point:** 1740 °C (3164 °F)

**Formula Weight:** 207.19

**Freezing/Melting Point:** 327.4 °C (621.32 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 11.34

**Volatile Component (% Vol):** Not applicable

**Evaporation Rate:** Not applicable

**Water Solubility:** Insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Hazardous polymerization will not occur. Stable under normal storage conditions.

**Storage Incompatibilities:** Avoid storage with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

## Section 11 - Toxicological Information

### Toxicity

Oral (woman) TD<sub>Lo</sub>: 450 mg/kg/6 years

Inhalation (human) TC<sub>Lo</sub>: 0.01 mg/m<sup>3</sup>

WARNING: Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.

### Irritation

Nil Reported

See RTECS OF 7525000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** If released or deposited on soil, it will be retained in the upper 2-5 cm of soil, especially soils with at least 5% organic matter or a pH 5 or above. Leaching is not important under normal conditions although there is some evidence to suggest that it is taken up by some plants. Generally, the uptake from soil into plants is not significant. It is expected to slowly undergo speciation to the more insoluble sulfate, sulfide, oxide, and phosphate salts. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores. It is a stable metal and adherent films of protective insoluble salts form that protect the metal from further corrosion. That which dissolves tends to form ligands. It is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (the carbonate or sulfate, sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates. It does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. When released to the atmosphere, it will generally be in dust or adsorbed to particulate matter and subject to gravitational settling and be transformed to the oxide and carbonate.

**Ecotoxicity:** LC<sub>50</sub> Japanese quail (*Coturnix japonica*), males or females, 14 days old, oral (5-day ad libitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remitted at 11, 11 & 12 days, respectively, no mortality was observed; control references were dieldrin & dicrotophos; corn oil diluent was added to diet at ratio of 2:98 by wt; (extreme concentrations: 1,000-5,000 ppm)

**BCF:** freshwater fish 1.38 to 1.65

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options.  
Follow applicable federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** None

## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 10 lb (4.535 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# Mercury

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

44/60

**Material Name:** Mercury

**CAS Number:** 7439-97-6

**Chemical Formula:** Hg

**EINECS Number:** 231-106-7

**ACX Number:** X1002555-9

**Synonyms:** COLLOIDAL MERCURY; HYDRARGYRUM; KWIK; LIQUID SILVER; MERCURE; MERCURIO; MERCURY; MERCURY (ELEMENTAL); MERCURY METAL; COLLOIDAL MERCURY; MERCURY, METALLIC; METALLIC MERCURY; QUECKSILBER; QUICK SILVER; QUICKSILVER; QUICKSILVER SYNONYMS OF; RTEC

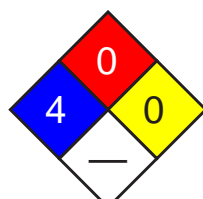
**Derivation:** Obtained by roasting cinnabar (mercury sulfide) and purified by distillation, or as a by-product of gold mining.

**General Use:** Used in agricultural poisons, anti-fouling paint, dental amalgams, mining amalgamation (to remove gold and other metals from ore), thermometers, barometers, dry cell batteries, chlorine and caustic soda production, electrical apparatus, and as a neutron absorber in nuclear power plants.

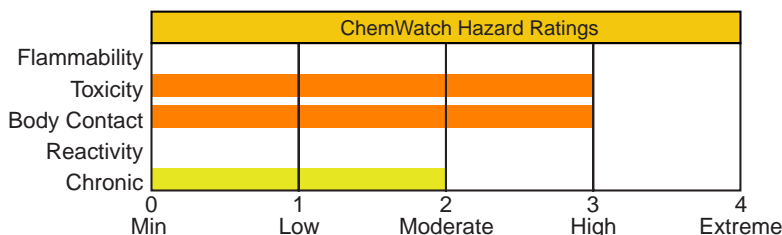
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Mercury		ca 100% wt
<b>OSHA PEL</b> Ceiling: 0.1 mg/m <sup>3</sup> .	<b>NIOSH REL</b> Hg Vapor: TWA: 0.05 mg/m <sup>3</sup> ; skin. Other: Ceiling 0.1 mg/m <sup>3</sup> ; skin.	<b>DFG (Germany) MAK</b> TWA: 0.1 mg/m <sup>3</sup> ; PEAK: 0.8 mg/m <sup>3</sup> ; danger of sensitization of the skin.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 0.05 mg/m <sup>3</sup> ; STEL: 0.1 mg/m <sup>3</sup> .	<b>IDLH Level</b> 10 mg/m <sup>3</sup> (as Hg).	
<b>ACGIH TLV</b> TWA: 0.025 mg/m <sup>3</sup> ; skin.		

## Section 3 - Hazards Identification



Fire Diamond



ANSI Signal Word

**Danger!**

HMIS	
4	Health
0	Flammability
0	Reactivity



Poison



Corrosive

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Heavy silver-white liquid metal; odorless. Corrosive. Poison. Other Acute Effects: irreversible nervous system damage.

### Potential Health Effects

**Target Organs:** Central nervous system, eyes, skin, respiratory system, liver, kidneys.

**Primary Entry Routes:** Inhalation, eye and skin contact/absorption.

**Acute Effects** The onset of signs and symptoms usually is prompt, but may be delayed up to 12 hr.

**Systemic Effects by all routes:** Nausea, vomiting, abdominal pain, diarrhea, excessive salivation, sweating, headache, giddiness, vertigo (dizziness), weakness, blurring or dimness of vision, miosis or mydriasis (dilatation of the pupils), tearing, bradycardia (slow heart beat), tachycardia (fast heart beat), cardiac irregularities (arrhythmias, complete heart block), loss of muscle coordination, slurred speech, muscle twitching (particularly tongue and eyelids), generalized profound weakness, confusion, disorientation, drowsiness, difficulty in breathing, excessive secretion of saliva and mucus, cyanosis, rales, high blood pressure, random jerky movements, incontinence, convulsions, coma, and death due to respiratory paralysis.

**Inhalation:** Exposure to high vapor concentrations can cause severe respiratory damage. Other symptoms include wakefulness, muscle weakness, anorexia, headache, ringing in the ear, headache, diarrhea, liver changes, fever, gingivitis, chest pain, difficulty breathing, cough, inflammation of the mouth (stomatitis), salivation, bronchitis, and pneumonitis. Acrodynia (pink or Swifts disease), characterized by redness and peeling of the skin on the toes and fingers, was commonly seen in children in the 1950s and is still *infrequently* seen in workers.

**Eye:** Irritation and corrosion.

**Skin:** Skin can become severely irritated if allowed to remain in contact with mercury. Skin absorption will occur at 2.2% of the rate of absorption through the lungs.

**Ingestion:** Mercury generally passes through the digestive tract uneventfully. However, large amounts may get caught up in the intestine and require surgical removal. If an abscess or other perforation is present along the digestive tract, absorption into the blood stream with subsequent mercury poisoning is possible.

**Carcinogenicity:** NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** Central nervous system disorders.

**Chronic Effects:** Chronic exposure appears more common than acute and is primarily associated with central nervous system damage which can be permanent (ex. paresthesia of the hands, lips, feet). Early signs of toxicity include weakness, fatigue, anorexia, weight loss, and gastrointestinal disturbances. If exposure levels are high, characteristic tremors of the fingers, eyelids, and lips occur with progression to generalized tremors of the entire body. Psychic disorders are noticeable and characterized by behavior and personality changes, increased excitability, memory loss, insomnia, and depression. In severe cases, delirium and hallucinations may occur. Kidney damage is observed with oliguria (decreased urine output) progressing to anuria (urine cessation) and may require dialysis. The cornea and lens of the eyes may take on a brownish discoloration and the extraocular muscles may be damaged. This syndrome has been termed *Asthenic-Vegetative Syndrome* or *Micromercurialism*. Chronic symptoms occur increasingly with exposures to 0.1 mg/m<sup>3</sup> or higher. *Mutation:* Aneuploidy and other chromosomal aberrations have been observed in the lymphocytes from whole blood cultures in workers exposed to mercury. *Reproductive:* Mercury has been detected in stillborn babies of women treated with mercury for syphilis. In a study of six men acutely exposed (occupationally) to mercury levels as high as 44 mg/m<sup>3</sup>, all suffered impaired sexual function. Repeated skin contact may cause allergic dermatitis in some individuals.

**Note:** Spilled mercury will release sufficient vapor over time to produce chronic poisoning.

## Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water and then wash exposed area with soap. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. In general, mercury will pass through the digestive tract uneventfully.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** BEI: *blood* (15 µg/L), *urine*: (35 µg/g creatinine). Extremely high urine levels of 0.5 to 0.85 mg Hg/L are indicative of polyneuropathy. 0.4 to 22 µg/L is reported to be the human lethal blood level. Obtain urinalysis including at a minimum: albumin, glucose, and a microscopic examination of centrifuged sediment. Use BAL or 2, 3-dimercaptosuccinic acid as chelators. *Do not* use calcium sodium EDTA because of nephrotoxicity. An electromyograph may determine extent of nerve dysfunction. It has been noted that exposure to mercury may predispose persons to development of carpal tunnel syndrome.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** Nonflammable

**Autoignition Temperature:** Nonflammable

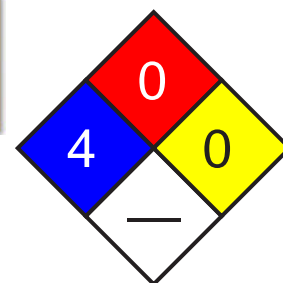
**LEL:** None reported.

**UEL:** None reported.

**Extinguishing Media:** Use agents suitable for surrounding fire.

**General Fire Hazards/Hazardous Combustion Products:** Toxic mercury vapor and mercuric oxide.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Keep a mercury spill kit readily available in areas where mercury is used.

Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.

**Small Spills:** Small and Large Spills: Follow instructions on mercury spill kit. Most kits come with an aspiration-driven vacuum trap with a mercury "sweeper" (copper or copper-plated brush). Wash spill area with a dilute calcium sulfide or nitric acid solution. If spill cannot be taken up readily, dust the top of the spill with flowers of sulfur or preferably, calcium polysulfide. This will produce a surface coating of mercury sulfide which will reduce mercury vapor dispersion into the air.

**Large Spills:** No data found.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Use appropriate PPE when working with mercury. *Do not* use on porous work surfaces (wood, unsealed concrete, etc.) to prevent spills from lodging in cracks.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in a cool, dry, well-ventilated area away from heat and incompatibles (Sec. 10). Store on non-porous floors and wash them regularly with a dilute calcium sulfide solution. Because mercury will form amalgamations with most metals except iron, metal shelves should be painted with a sufficiently thick coating to prevent this from happening.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Wherever possible, enclose processes to prevent mercury vapor dispersion into work area.

Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2).

Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider pre-placement and periodic medical exams of exposed workers with emphasis on the skin, eyes, central nervous system, liver, and kidneys.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber, nitrile rubber, fluorocarbon rubber, neoprene rubber, polyvinyl chloride, chlorinated polyethylene, or polycarbonate to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For  $\leq 0.5 \text{ mg/m}^3$ , use any chemical cartridge respirator with cartridges providing protection against mercury and equipped with an ESLI (end of service life indicator), any SCBA, or any SAR (supplied-air respirator). For  $\leq 1.25 \text{ mg/m}^3$ , use any SAR operated in continuous-flow mode, any PAPR (powered, air-purifying respirator) with an ESLI. For  $\leq 2.5 \text{ mg/m}^3$ , use any SCBA or SAR with a full facepiece, any SAR with a tight-fitting facepiece and operated in continuous-flow mode, or any chemical cartridge respirator with a full facepiece, chemical cartridges providing protection against mercury, and equipped with an ESLI. For  $\leq 28 \text{ mg/m}^3$ , use any SAR operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA with full facepiece and operated in pressure-demand or other positive pressure mode. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.



**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Silvery-white, odorless.

**Physical State:** Liquid metal

**Vapor Pressure (kPa):** 0.0018 mm Hg at 77 °F (25 °C)

**Formula Weight:** 200.59

**Density:** 13.534 g/cm<sup>3</sup> at 77 °F (25 °C)

**Boiling Point:** 674.09 °F (356.72 °C)

**Freezing/Melting Point:** -37.97 °F (-38.87 °C)

**Viscosity:** 15.5 mP at 77 °F (25 °C)

**Surface Tension:** 484 dyne/cm at 77 °F (25 °C)

**Critical Temperature:** 2664 °F (1462 °C)

**Critical Pressure:** 1587 atm

**Water Solubility:** 0.28 µmol/L at 77 °F (25 °C)

**Other Solubilities:** Soluble in boiling sulfuric acid, nitric acid (reacts); slightly in lipids, and 2.7 mg/L in pentane. Insoluble in alcohol, ether, cold sulfuric acid, hydrogen bromide, and hydrogen iodide.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Mercury does not tarnish at ordinary temperatures but when heated to near its boiling point, it slowly oxidizes to mercuric oxide. Hazardous polymerization does not occur. Exposure to high temperatures, metal surfaces or incompatibles.

**Storage Incompatibilities:** Mercury forms alloys (amalgamates) with most metals except iron. It is incompatible with oxidizers such as bromine, 3-bromopropyne, methylsilane + oxygen, chlorine, chlorine dioxide, nitric acid, or peroxyformic acid; tetracarbonyl nickel + oxygen, alkynes + silver perchlorate, ethylene oxide, acetylenic compounds (explosive), ammonia (explosive), boron phosphodiiodide, methyl azide, nitromethane, and ground sodium carbide.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of mercury can produce mercuric oxide.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Man, oral, TD<sub>Lo</sub>: 43 mg/kg caused tremor and jaundice or other liver changes.

### Acute Inhalation Effects:

Woman, inhalation, TC<sub>Lo</sub>: 150 µg/m<sup>3</sup>/46 days caused anorexia, diarrhea, and wakefulness.

Man, inhalation, TC<sub>Lo</sub>: 44300 µg/m<sup>3</sup>/8 hr caused muscle weakness, liver changes, and increased body temperature.

### Acute Skin Effects:

Man, skin, TD<sub>Lo</sub>: 129 mg/kg for 5 continuous hours caused ringing in the ears, headache, and allergic dermatitis.

### Other Effects:

Rat, inhalation: 1 mg/m<sup>3</sup>/24 hr for 5 continuous weeks caused proteinuria.

Rat, inhalation: 890 ng/m<sup>3</sup>/24 hr for 16 weeks prior to mating had an effect on spermatogenesis.

See RTECS OV4550000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Mercury is expected to volatilize rapidly when deposited on soil surfaces. Once in the air, it can be transported long distances before being redeposited on soil or in water. In water, mercury appears to bind to particulates where it eventually becomes deposited on the bed sediment. In general, mercury entering the environment can be deposited and revolatilized several times.

**Ecotoxicity:** Catfish, LC<sub>50</sub> = 0.35 mg/L/96 hr; mollusk (*Modiolus carvalhoi*), LC<sub>50</sub> = 0.19 ppm/96 hr; tadpole (*Rana hexadactyla*), LC<sub>50</sub> = 0.051 ppm/96 hr. Mercury is transformed to methyl mercury by bacteria in the environment and undergoes bioaccumulation readily. BCF for freshwater fish = 63,000; for saltwater fish = 10,000; and for marine and freshwater invertebrates = 100,000.

## Section 13 - Disposal Considerations

**Disposal:** Incineration is *not* an appropriate disposal method. Wastewater may be treated by addition of chlorine to oxidize the mercury to its ionic state. The water can then be passed through an absorbent (an activated charcoal concentrate with a sulfur coating or peanut shell charcoal) to collect the ionic mercury, followed by distillation to recover the mercury. Sodium borohydride, a reducing agent, can be used to precipitate mercury from waste solutions. Bioremediation, using *Pseudomonas putida*, has also been suggested. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):****Shipping Name and Description:** Mercury**ID:** UN2809**Hazard Class:** 8 - Corrosive material**Packing Group:** III - Minor Danger**Symbols:** A W**Label Codes:** 8 - Corrosive**Special Provisions:****Packaging:** Exceptions: 164 **Non-bulk:** 164 **Bulk:** 240**Quantity Limitations:** Passenger aircraft/rail: 35 kg **Cargo aircraft only:** 35 kg**Vessel Stowage:** Location: B **Other:** 40, 97**Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Listed U151 Toxic Waste**CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

**Methanol**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

51/60

**Material Name:** Methanol

**CAS Number:** 67-56-1

**Chemical Formula:** CH<sub>4</sub>O

**Structural Chemical Formula:** CH<sub>3</sub>OH

**EINECS Number:** 200-659-6

**ACX Number:** X1001287-2

**Synonyms:** ALCOHOL,METHYL; ALCOOL METHYLIQUE; ALCOOL METILICO; CARBINOL; X-CIDE 402 INDUSTRIAL BACTERICIDE; COAT-B1400; COLONIAL SPIRIT; COLONIAL SPIRITS; COLUMBIAN SPIRIT; COLUMBIAN SPIRITS; EPA PESTICIDE CHEMICAL CODE 053801; EUREKA PRODUCTS CRIOSINE DISINFECTANT; EUREKA PRODUCTS,CRIOSINE; FREERS ELM ARRESTER; IDEAL CONCENTRATED WOOD PRESERVATIVE; METANOL; METANOLO; METHANOL; METHYL ALCOHOL; METHYL HYDRATE; METHYL HYDROXIDE; METHYLALKOHOL; METHYLOL; METYLOWY ALKOHOL; MONOHYDROXYMETHANE; PMC REJEX-IT F-40ME; PYROLIGNEOUS SPIRIT; PYROXYLIC SPIRIT; PYROXYLIC SPIRITS; SURFLO-B17; WILBUR-ELLIS SMUT-GUARD; WOOD ALCOHOL; WOOD NAPHTHA; WOOD SPIRIT

**Derivation:** Prepared by wood pyrolysis; non-catalytic oxidation of hydrocarbons; as a by-product in the fisher-tropsch synthesis; or by reduction of carbon monoxide.

**General Use:** Used as an industrial solvent; starting material for organic synthesis; antifreeze for windshield washer fluid; in fuel antifreezes; gasoline octane booster; fuel for stoves; extractant for oils; denaturing ethanol; softening agent; food additive; in paint, varnish removers, and embalming fluids; in the manufacture of photographic film, celluloid, textile soap, wood stains, coated fabrics, shatterproof glass, paper coating, waterproofing formulations, artificial leather, dyes.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
Methanol	67-56-1	ca 100% vol

**Trace Impurities:** (Grade A): Acetone and aldehydes < 30 ppm, acetic acid < 30 ppm

### OSHA PEL

TWA: 200 ppm; 260 mg/m<sup>3</sup>.

### OSHA PEL Vacated 1989 Limits

TWA: 200 ppm; 260 mg/m<sup>3</sup>;  
 STEL: 250 ppm; 325 mg/m<sup>3</sup>.

### ACGIH TLV

TWA: 200 ppm; STEL: 250 ppm;  
 skin.

### NIOSH REL

TWA: 200 ppm, 260 mg/m<sup>3</sup>;  
 STEL: 250 ppm, 325 mg/m<sup>3</sup>;  
 skin.

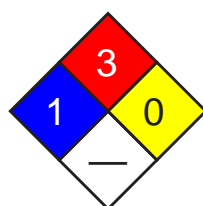
### IDLH Level

6000 ppm.

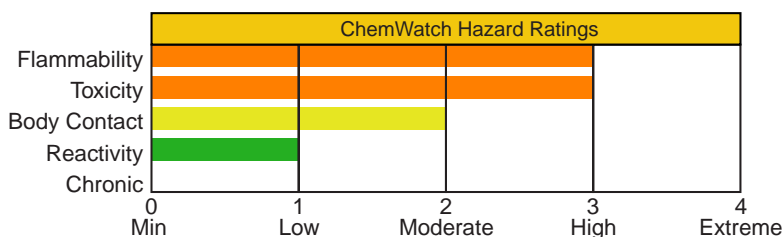
### DFG (Germany) MAK

TWA: 200 ppm; PEAK: 800 ppm;  
 skin.

## Section 3 - Hazards Identification



Fire Diamond



### ANSI Signal Word

**Warning!**

HMIS	
2	Health
3	Flammability
0	Reactivity



Flammable

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Colorless liquid; slight alcohol odor when pure or disagreeably pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: headache, visual disturbance, blindness, respiratory failure. Chronic Effects: reproductive effects reported in animal testing. Flammable; moderate explosion hazard.

**Potential Health Effects**

**Target Organs:** Eyes, skin, central nervous system (CNS), gastrointestinal (GI) tract, respiratory system

**Primary Entry Routes:** Inhalation, ingestion, skin and/or eye contact/absorption

**Acute Effects**

**Inhalation:** Irritation, breathing difficulty, headache, drowsiness, vertigo, light-headedness, nausea, vomiting, acidosis (decreased blood alkalinity), visual disturbance, and at high concentrations, CNS damage, convulsions, circulatory collapse, respiratory failure, coma and blindness can result from inhalation of methanol vapor. Concentration  $\geq 200$  ppm may cause headache; 50,000 ppm can cause death within 1-2 hrs.

**Eye:** Contact with liquid may result in irritation, inflamed lids, light sensitization, and superficial lesions.

**Skin:** Contact may cause irritation, dermatitis, swelling, scaling, and systemic effects.

**Ingestion:** GI irritation and systemic effects. Symptoms may be delayed 18-48 hours. Fatal dose - 2 to 8 ounces.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

**Chronic Effects:** Exposure to methanol vapors has caused conjunctivitis, headache, giddiness, insomnia, GI disturbance, impaired vision. CNS damage is also likely. Methanol is slowly eliminated from the body; exposure is considered cumulative over the short term.

**Section 4 - First Aid Measures**

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develops.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Follow emesis with rehydration, correction of acidosis, and folate to enhance formate oxidation. Consider IV administration of ethanol (if blood methanol  $>20$  mg/dL) to show metabolic oxidation of methanol. Assay formic acid in urine, blood pH and plasma bicarbonate.

See  
DOT  
ERG

**Section 5 - Fire-Fighting Measures**

**Flash Point:** 54 °F (12 °C), Closed Cup

**Burning Rate:** 1.7 mm/min

**Autoignition Temperature:** 867 °F (464 °C)

**LEL:** 6.0% v/v

**UEL:** 36% v/v

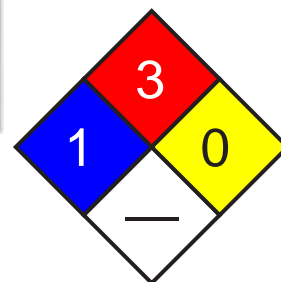
**Flammability Classification:** OSHA Class IB Flammable Liquid.

**Extinguishing Media:** Use dry chemical, carbon dioxide, water spray, fog or alcohol-resistant foam. A water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

**General Fire Hazards/Hazardous Combustion Products:** Heating methanol to decomposition can produce carbon oxides (CO<sub>x</sub>), formaldehyde, acrid smoke, and irritating fumes. Can form explosive mixtures in the air. The heavier-than-air vapors of methanol may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

**Fire-Fighting Instructions:** *Do not* scatter material with any more water than needed to extinguish fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Isolate spill area for at least 330-660 feet (100-200 m) in all directions. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors.



**Small Spills:** Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Use clean non-sparking tools to collect absorbed material.

**Large Spills:** Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid vapor inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves, goggles, and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

**Regulatory Requirements:** Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class 1B Flammable Liquids.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Enclose operations and/or provide local explosion-proof exhaust ventilation at the site of chemical release. Where possible, transfer methanol from drums or other storage containers to process containers. Minimize sources of ignition in surrounding areas.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets of butyl rubber, Teflon, Viton, Saranex, 4H, Responder, Trelchem HPS, or Tychem 10000 (Breakthrough Time (BT) >8 hr) to prevent skin contact. Natural rubber, neoprene, nitrile rubber, polyethylene, polyvinyl alcohol and CPF 3 may degrade after contact and are not recommended. Wear splash-proof chemical safety goggles, and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations  $\leq$  2000 ppm, use a supplied air respirator;  $\leq$  5000 ppm, supplied air (SA) respirator in continuous flow mode;  $\leq$  6000 ppm, SA respirator with tight-fitting face mask operated in continuous flow mode, or SCBA with full facepiece, or SA respirator with full facepiece;  $>$  IDLH/unknown/emergency, SCBA with full facepiece operated in pressure-demand or other positive-pressure mode, or SA respirator with full facepiece operated in pressure-demand or other positive-pressure mode in combination with auxiliary SCBA operated in pressure-demand or other positive-pressure mode. For escape, use an appropriate escape-type SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless; slight alcohol odor when pure, disagreeably pungent odor when crude.

**Physical State:** Liquid

**Formula Weight:** 32.04

**Vapor Pressure (kPa):** 127 mm Hg at 77 °F (25 °C)

**Density:** 0.796 g/mL at 59 °F (15 °C)

**Vapor Density (Air=1):** 1.11

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.81 at 0 °C/4 °C

**Bulk Density:** 6.59 lbs/gal at 68 F (20 °C)

**Refractive Index:** 1.3292 at 68 °F (20 °C)

**pH:** Slightly acidic  
**Boiling Point:** 148 °F (64.7 °C) at 760 mm Hg  
**Freezing/Melting Point:** -144.04 °F (-97.8 °C)  
**Viscosity:** 0.614 mPa sec  
**Surface Tension:** 22.61 dynes/cm

**Ionization Potential (eV):** 10.84 eV  
**Water Solubility:** Miscible  
**Other Solubilities:** Ethanol, acetone, benzene, chloroform, DMSO, ether, ketones, most organic solvents.

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Methanol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Vapor inhalation, oxidizers.

**Storage Incompatibilities:** Include beryllium dihydride, metals (potassium, magnesium), oxidants (barium perchlorate, bromine, chlorine, hydrogen peroxide, sodium hypochlorite, phosphorus trioxide), potassium tertbutoxide, carbon tetrachloride and metals, chloroform and heat, diethyl zinc, alkyl aluminum salts, acetyl bromide, chloroform and sodium hydroxide, cyanuric chloride, nitric acid, chromic anhydride, lead perchlorate.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of methanol can produce carbon oxides (CO<sub>x</sub>), formaldehyde, acrid smoke, and irritating fumes.

## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 5628 mg/kg.

Human, oral, LD<sub>Lo</sub>: 428 mg/kg produced toxic effects: behavioral - headache; lungs, thorax, or respiration - other changes.

Human, oral, LD<sub>Lo</sub>: 143 mg/kg produced optic nerve neuropathy, dyspnea, nausea or vomiting.

### Acute Inhalation Effects:

Rat, inhalation, LC<sub>50</sub>: 64000 ppm/4 hr.

Human, inhalation, TC<sub>Lo</sub>: 300 ppm produced visual field changes, headache; lungs, thorax, or respiration - other changes.

### Acute Skin Effects:

Rabbit, skin, LD<sub>50</sub>: 15800 mg/kg.

Monkey, skin, LD<sub>Lo</sub>: 393 mg/kg.

### Irritation Effects:

Rabbit, standard Draize test: 100 mg/24 hr resulted in moderate irritation.

Rabbit, standard Draize test: 20 mg/24 hr resulted in moderate irritation.

### Other Effects:

Rat, oral: 10 µmol/kg resulted in DNA damage.

Rat, inhalation: 50 mg/m<sup>3</sup>/12 hr/13 weeks intermittently produced degenerative changes to brain and coverings; muscle contraction or spasticity.

Rat, inhalation: 2610 ppm/6 hr/4 weeks intermittently produced toxic effects: endocrine - changes in spleen weight.

Multiple Dose Toxicity Effects - Rat, oral: 12 g/kg/8 weeks intermittently produced toxic effects: behavioral - ataxia; behavioral - alteration of operant conditioning.

Human, lymphocyte: 300 mmol/L resulted in DNA inhibition.

Rat (female), oral: 7500 mg/kg, administered during gestational days 17-19 produced effects on newborn - behavioral.

Rat (female), oral: 35295 mg/kg administered during gestational days 1-15 produced effects on the fertility index; pre implantation mortality; and post-implantation mortality.

Rat (female), inhalation: 20000 ppm/7 hr, administered during gestational days 1-22 produced specific developmental abnormalities - musculoskeletal system; cardiovascular (circulatory) system; urogenital system.

Rat (male), oral: 200 ppm/20 hr, 78 weeks prior to mating produced paternal effects - testes, epididymis, sperm duct.

See RTECS PC1400000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Bioconcentration (BCF, estimated at 0.2) is not expected to be significant. Physical removal from air can occur via rainfall. Relatively rapid evaporation from dry surfaces is likely to occur. If released to the atmosphere, it degrades via reaction with photochemically produced hydroxyl radicals with an approximate half-life of 17.8 days. If released to water or soil, biodegradation is expected to occur. A low K<sub>oc</sub> indicates little sorption and high mobility in the soil column.

**Ecotoxicity:** Trout, LC<sub>50</sub>: 8,000 mg/L/48 hr; *Pimephales promelas* (fathead minnow) LC<sub>50</sub>: 29.4 g/L/96 hr.

**Henry's Law Constant:** 4.55 x 10<sup>-6</sup> atm-m<sup>3</sup>/mole at 77 °F (25 °C)

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = -0.77

**Soil Sorption Partition Coefficient:** K<sub>oc</sub> = 0.44

## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Methanol

**ID:** UN1230

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:** + I

**Label Codes:** 3 - Flammable Liquid, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** IB2, T7, TP2

**Packaging:** Exceptions: 150 Non-bulk: 202 Bulk: 242

**Quantity Limitations:** Passenger aircraft/rail: 1 L Cargo aircraft only: 60 L

**Vessel Stowage:** Location: B Other: 40



**Shipping Name and Description:** Methanol

**ID:** UN1230

**Hazard Class:** 3 - Flammable and combustible liquid

**Packing Group:** II - Medium Danger

**Symbols:** D - Domestic transportation

**Label Codes:** 3 - Flammable Liquid

**Special Provisions:** IB2, T7, TP2

**Packaging:** Exceptions: 150 Non-bulk: 202 Bulk: 242

**Quantity Limitations:** Passenger aircraft/rail: 1 L Cargo aircraft only: 60 L

**Vessel Stowage:** Location: B Other:



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Listed U154 Ignitable Waste

**CERCLA 40 CFR 302.4:** Listed per RCRA Section 3001 5000 lb (2268 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



**Nickel**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Nickel

**CAS Number:** 7440-02-0

**Chemical Formula:** Ni

**Structural Chemical Formula:** Ni

**EINECS Number:** 231-111-4

**ACX Number:** X1002560-0

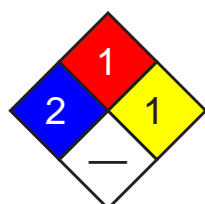
**Synonyms:** ALCAN 756; C.I. 77775; CARBONYL NICKEL POWDER; EL12; FIBREX; FIBREX P; NI 0901-S; NI 4303-S; NI 4303T; NI-4303T; NI 270; NI 0901-S (HARSHAW); NICHEL; NICKEL; NICKEL 200; NICKEL 201; NICKEL 205; NICKEL 207; NICKEL 270; NICKEL CATALYST SYNONYMS OF OTHER NICKEL COMPOUNDS VARY DEPENDING UPON THE SPECIFIC COMPOUND; NICKEL (DUST); NICKEL METAL; ELEMENTAL NICKEL; NICKEL PARTICLES; NICKEL SPONGE; NICKEL,METAL; NICKLE CATALYST,WET; NP-2; NP 2; PULVERIZED NICKEL; RANEY ALLOY; RANEY NICKEL; RCH 55/5

**General Use:** Used in the manufacture of Monel metal, stainless steels, and nickel -chrome resistance wire; nickel-plating; various alloys such as new silver, Chinese silver, German silver; for coins, electrotypes, storage batteries. Used for magnets, lightning-rod tips, electrical contacts and electrodes, spark plugs, machinery parts; catalyst for hydrogenation of oils and other organic substances; in alloys for electronic and space applications.

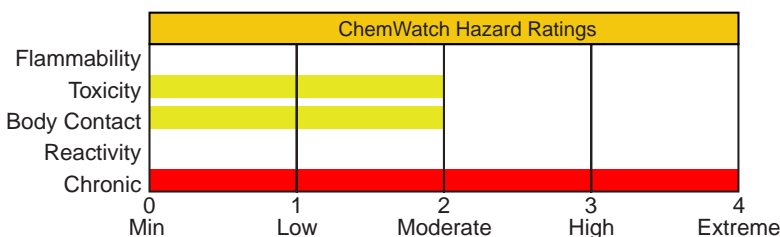
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
nickel	7440-02-0	> 99
<b>OSHA PEL</b> TWA: 1 mg/m <sup>3</sup> .	<b>NIOSH REL</b> TWA: 0.015 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> Danger of sensitization of the airways and the skin.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 1 mg/m <sup>3</sup> ; Insoluble as Ni. Other Values: soluble as Ni mg/m <sup>3</sup> ; 0.1.	<b>IDLH Level</b> 10 mg/m <sup>3</sup> (as Ni).	
<b>ACGIH TLV</b> TWA: 1.5 mg/m <sup>3</sup> ; measured as inhalable fraction of the aerosol.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
1	Flammability
1	Reactivity

ANSI Signal Word

**Warning!**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Silvery-white metal powder. Irritating. Other Acute Effects: metal fume fever, asthma, noninfectious pneumonia, vomiting, abdominal pain, nickel itch. Possible cancer hazard. Chronic Effects: sensitization, perforation of nasal septum.

### Potential Health Effects

**Target Organs:** nasal cavities, lungs, skin

**Primary Entry Routes:** inhalation, skin contact, ingestion

**Acute Effects**

**Inhalation:** The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.

Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

Regular exposure to nickel fume, as the oxide, may result in "metal fume fever" a sometimes debilitating upper respiratory tract condition resembling influenza.

Symptoms include malaise, fever, weakness, nausea and may appear quickly if operations occur in closed or poorly ventilated areas.

Pulmonary edema, pulmonary fibrosis and asthma has been reported in welders using nickel alloys; levels of exposure are generally not available and case reports are often confounded by mixed exposures to other agents.

Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.

Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.

**Eye:** The dust may produce eye discomfort and abrasive eye inflammation.

**Skin:** The material may be mildly discomforting to the skin.

Nickel dusts, fumes and salts are potent contact allergens and sensitizers producing a dermatitis known as "nickel" rash.

In the absence of properly designed ventilation systems or where respiratory protective devices are inadequate, up to 10% of exposed workers are expected to be symptomatic.

**Ingestion:** The material may be mildly discomforting to the gastrointestinal tract if swallowed in large quantity.

The potential to generate small quantities of nickel chloride in the stomach may produce a low order toxic effect.

Nickel salts cause vomiting, following ingestion, as a result of astringent and irritant effects. In common with other irritant-emetics the lethal dose varies widely. Absorption is generally poor and systemic poisoning is rare.

Systemic effects include increased blood sugar levels (hyperglycemia), capillary damage (especially in the brain and adrenals), kidney damage, heart damage (myocardial weakness) and central nervous system depression.

**Carcinogenicity:** NTP - Class 2A, Reasonably anticipated to be a carcinogen, limited evidence of carcinogenicity from studies in humans; IARC - Group 1, Carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Not listed; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

**Chronic Effects:** Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Smaller particles however, may cause lung deterioration. Particles of less than 1.5 micron can be trapped in the lungs and, dependent on the nature of the particle, may give rise to further serious health consequences.

The most common toxic reaction to nickel is skin sensitization which may produce a chronic eczema called "nickel itch". The first symptom is itching which occurs up to 7 days prior to the appearance of skin eruption.

The primary skin eruption is erythematous or follicular and may be followed by superficial discrete ulcers (which discharge and become crusted), or eczema. In the chronic stages, pigmented or depigmented plaques may be formed. Recovery from the dermatitis usually occurs within 7 days but may take several weeks.

Nickel dusts and several specific compounds are carcinogenic in animals following inhalation or parenteral administration (but not by ingestion or skin contact). Increases in lung and nasal cavity cancers have been observed amongst nickel workers in smelters and refineries.

Respiratory cancer risks primarily relate to chronic exposure to soluble nickels at concentrations in excess of 1 mg Ni/m<sup>3</sup> and exposure to the less soluble forms at concentrations greater than 10 mg Ni/m<sup>3</sup>. Metallic nickel does not appear to pose such a threat.

When injected intramuscularly, nickel induced incidences of fibrosarcomas in rats and hamsters of both sexes, local sarcomas in rats of both sexes and local tumors with some metastases to pre-vertebral lymph nodes in female rats.

When injected intrapleurally, nickel powder induced round cell and spindle cell tumors at the site of injection in female rats.

Inhalation of nickel dusts induced lymphosarcomas in female mice and anaplastic intraalveolar carcinomas in male and female guinea pigs.

Subdermal implantation of nickel pellets induced sarcomas surrounding the pellet in rats of both sexes whilst intramedullary injection into the femur of rats produced neoplasms at or near the site of injection, including fibrosarcomas (neurogenic in origin).

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Seek medical attention if irritation or discomfort persist.

**Eye Contact:** Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Rinse mouth out with plenty of water. Seek medical attention if irritation or discomfort persist.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

\* Preplacement and periodic medical examinations of workers exposed to nickel are recommended. Preplacement examination should evaluate any history of skin allergies or asthma, other exposures to nickel, smoking history, condition of nasal cavity and lungs. Periodic examinations should include chest X-rays.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Not available; probably combustible

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** Sand, dry powder extinguishers or other inerts should be used to smother dust fires.

These are the only suitable means for extinguishing metal dust fires.

Do NOT use water.

**General Fire Hazards/Hazardous Combustion Products:** Metal powders, while generally regarded as noncombustible, may burn when metal is finely divided and energy input is high. Metal dust fires are slow moving but intense and difficult to extinguish. DO NOT disturb burning dust. Explosion may result if dust is stirred into a cloud, by providing oxygen to a large surface of hot metal. DO NOT use water or foam as generation of explosive hydrogen may result.

When heated with sulfur reacts with incandescence.

If involved in fire, may produce toxic fumes of nickel carbonyl and nickel.

**Fire Incompatibility:** Avoid reaction with nitric acid and other strong acids, oxidizing agents and sulfur compounds. Nickel dust reacts violently with titanium, ammonium nitrate, potassium perchlorate and hydrazoic acid.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

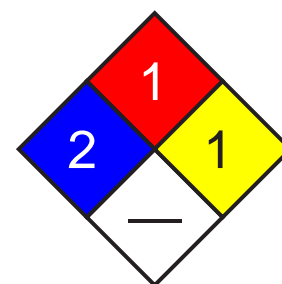
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

Do not approach containers suspected to be hot.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear protective clothing, impervious gloves and safety glasses.

Use dry clean-up procedures and avoid generating dust.

Vacuum up or sweep up.

Place in suitable containers for disposal.

**Large Spills:** Clear area of personnel and move upwind.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Stop leak if safe to do so.

Use dry clean-up procedures and avoid generating dust.

Collect recoverable product into labeled containers for recycling.

Collect residues and seal in labeled drums for disposal.

Wash spill area with large quantities of water.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.

Always wash hands with soap and water after handling.

Avoid physical damage to containers. Use good occupational work practices.

Observe manufacturer's storing and handling recommendations.

**Recommended Storage Methods:** Packaging as recommended by manufacturer.

Check that containers are clearly labeled.

Glass container.

Plastic drum.

Plastic bag.

Polyethylene or polypropylene container.

Metal drum.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Metal dusts must be collected at the source of generation as they are potentially explosive.

1. Vacuum cleaners, of flame-proof design, should be used to minimize dust accumulation.
2. Metal spraying and blasting should, where possible, be conducted in separate rooms. This minimizes the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminum, zinc, magnesium or titanium.
3. Work-shops designed for metal spraying should possess smooth walls and a minimum of obstructions, such as ledges, on which dust accumulation is possible.
4. Wet scrubbers are preferable to dry dust collectors.
5. Bag or filter-type collectors should be sited outside the workrooms and be fitted with explosion relief doors.
6. Cyclones should be protected against entry of moisture as reactive metal dusts are capable of spontaneous combustion in humid or partially wetted state.
7. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 meter/sec.

Special ventilation requirements apply for processes which result in the generation of barium, chromium, lead, or nickel fume and in those processes which generate ozone.

The use of mechanical ventilation by local exhaust systems is required as a minimum in all circumstances (including outdoor work).

In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminum. Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 meter/sec.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses. Chemical goggles.

Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious gloves; rubber gloves.

Neoprene gloves.

Safety footwear.

Rubber boots.

**Respiratory Protection:**

Exposure Range >1 to <10 mg/m<sup>3</sup>: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 10 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: odor threshold unknown

**Other:** Overalls. Barrier cream. Eyewash unit.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Lustrous silver-white, hard, ferromagnetic metal. Soluble in dilute nitric acid; slightly soluble in hydrochloric acid and sulfuric acid. Insoluble in ammonia. Mohs' hardness:3.8

Welding flux grades typical sieve analysis (cumulative retention %):- 200 um 0, 150 um 2, 100 um 12, 75 um 60, 63 um 80, 43 um 98.

**Physical State:** Solid

**Vapor Pressure (kPa):** 0.13 at 1810 °C

**Formula Weight:** 58.71

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 8.9

**Evaporation Rate:** Non-volatile

**pH:** Not applicable

**pH (1% Solution):** Not applicable

**Boiling Point:** 2730 °C (4946 °F)

**Freezing/Melting Point:** 1455 °C (2651 °F)

**Volatile Component (% Vol):** Nil at 38 °C

**Water Solubility:** Insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid reaction with oxidizing agents. Reacts with acids producing flammable/explosive hydrogen (H<sub>2</sub>) gas.

**Section 11 - Toxicological Information****Toxicity**

Oral (rat) LD<sub>50</sub>: 5000 mg/kg

See RTECS QR 5950000, for additional data.

**Section 12 - Ecological Information**

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

**Section 13 - Disposal Considerations**

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Bury residue in an authorized landfill.

Recycle containers if possible, or dispose of in an authorized landfill.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** None

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 100 lb (45.35 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# **Nitric Acid**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Nitric Acid

**CAS Number:** 7697-37-2

**Chemical Formula:** HNO<sub>3</sub>

**Structural Chemical Formula:** HNO<sub>3</sub>

**EINECS Number:** 231-714-2

**ACX Number:** X1002177-5

**Synonyms:** ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRICACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPOLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)

**General Use:** Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.

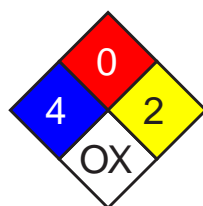
Used for etching and cleaning metals.

Operators should be trained in procedures for safe use of this material.

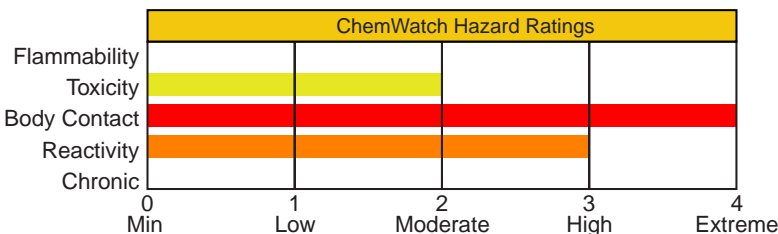
## Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95
<b>OSHA PEL</b> TWA: 2 ppm; 5 mg/m <sup>3</sup> .	<b>NIOSH REL</b> TWA: 2 ppm, 5 mg/m <sup>3</sup> ; STEL: 4 ppm, 10 mg/m <sup>3</sup> .	<b>DFG (Germany) MAK</b> TWA: 2 ppm; PEAK: 2 ppm.
<b>OSHA PEL Vacated 1989 Limits</b> TWA: 2 ppm; 5 mg/m <sup>3</sup> ; STEL: 4 ppm; 10 mg/m <sup>3</sup> .	<b>IDLH Level</b> 25 ppm.	
<b>ACGIH TLV</b> TWA: 2 ppm; STEL: 4 ppm.		

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
3	Health
0	Flammability
2	Reactivity

ANSI Signal Word

**Danger!**



Corrosive

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear to yellow fuming liquid; acrid, suffocating odor. Corrosive. Other Acute Effects: lung damage. Chronic Effects: tooth erosion, bronchitis. Strong oxidizer.

### Potential Health Effects

**Target Organs:** eyes, skin, respiratory system, teeth

**Primary Entry Routes:** inhalation, ingestion, skin contact, eye contact

#### Acute Effects

**Inhalation:** The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods. Inhalation hazard is increased at higher temperatures.



Reactions may occur following a single acute exposure or may only appear after repeated exposures.

Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later. The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.

Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.

Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.

Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

**Eye:** The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.

The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may produce moderate eye irritation leading to inflammation.

Repeated or prolonged exposure to irritants may produce conjunctivitis.

Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

**Skin:** The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.

Bare unprotected skin should not be exposed to this material.

The vapor is highly discomforting to the skin.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.

Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Immediately transport to hospital or doctor. DO NOT delay.

**Skin Contact:** Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

**Ingestion:** Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

See  
DOT  
ERG

Immediately transport to hospital or doctor. DO NOT delay.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.

4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

**INGESTION:**

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.

2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.

3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.

4. Charcoal has no place in acid management.

5. Some authors suggest the use of lavage within 1 hour of ingestion.

**SKIN:**

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.

2. Deep second-degree burns may benefit from topical silver sulfadiazine.

**EYE:**

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.

2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.

3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

## Section 5 - Fire-Fighting Measures

**Flash Point:** Nonflammable

**Autoignition Temperature:** Not applicable

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).

Carbon dioxide.

**General Fire Hazards/Hazardous Combustion Products:** Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

Decomposes on heating and produces toxic fumes of nitrogen oxides (NO<sub>x</sub>) and nitric acid.

**Fire Incompatibility:** Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with water and alkali.

Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H<sub>2</sub>S) as ignition may result.

Reacts with metals producing flammable/explosive hydrogen gas.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

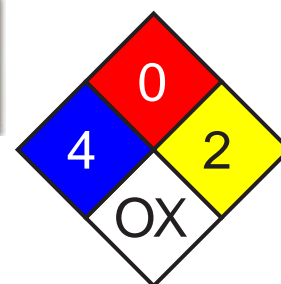
Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Dangerous levels of nitrogen oxides may form during spills of nitric acid.

Wear fully protective PVC clothing and breathing apparatus.

Clean up all spills immediately. No smoking, bare lights, ignition sources.

Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.

Avoid breathing dust or vapors and all contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.

Scoop up solid residues and seal in labeled drums for disposal.

Neutralize/decontaminate area.

Use soda ash or slaked lime to neutralize.

**Large Spills:** DO NOT touch the spill material. Restrict access to area.

Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

No smoking, flames or ignition sources. Increase ventilation.

Contain spill with sand, earth or other clean, inert materials.

NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.

Use spark-free and explosion-proof equipment.

Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.

Collect residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.

If contamination of drains or waterways occurs advise emergency services.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.

Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.

Avoid smoking, bare lights or ignition sources.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

**Recommended Storage Methods:** Stainless steel drum. Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area.

Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

**Personal Protective Clothing/Equipment:**

**Eyes:** Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.

Wear safety footwear or safety gumboots, e.g. Rubber.

**Respiratory Protection:**

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

**Other:** Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

**Glove Selection Index:**

BUTYL ..... Best selection

HYPALON ..... Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

PE/EVAL/PE ..... Best selection

SARANEX-23 ..... Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion

PVC..... Poor to dangerous choice for other than short-term immersion

NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear, colorless to slightly yellow liquid. Sharp strong odor.

**CAUTION:** exothermic dilution hazard.

**HIGHLY CORROSIVE.** Corrosive to most metals. Powerful oxidizing agent.

Darkens to brownish color on aging and exposure to light.

**Physical State:** Liquid

**Vapor Pressure (kPa):** 8.26

**Vapor Density (Air=1):** 1.5

**Formula Weight:** 63.02

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.3-1.42

**pH:** < 1

**pH (1% Solution):** 1

**Boiling Point:** 83 °C (181 °F) at 760 mm Hg

**Freezing/Melting Point:** -42 °C (-43.6 °F)

**Volatile Component (% Vol):** 100 (nominal)

**Decomposition Temperature (°C):** Not applicable

**Water Solubility:** Soluble in all proportions

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

## Section 11 - Toxicological Information

**Toxicity**

Oral (human) LD<sub>50</sub>: 430 mg/kg

Inhalation (rat) LC<sub>50</sub>: 2500 ppm/1 hr

Unreported (man) LD<sub>50</sub>: 110 mg/kg

**Irritation**

Nil reported

See RTECS QU 5775000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** LC<sub>50</sub> Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC<sub>50</sub> Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC<sub>50</sub> Cockle 330-1000 mg/l/48 hr /Aerated water conditions

**BCF:** no food chain concentration potential

**Biochemical Oxygen Demand (BOD):** none

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Special hazards may exist - specialist advice may be required.

Consult manufacturer for recycling options.  
 Follow applicable federal, state, and local regulations.  
 Treat and neutralize at an approved treatment plant.  
 Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.  
 Puncture containers to prevent reuse and bury at an authorized landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Nitric acid *other than red fuming, with more than 70 percent nitric acid*

**ID:** UN2031

**Hazard Class:** 8 - Corrosive material

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 8 - Corrosive, 5.1 - Oxidizer

**Special Provisions:** B47, B53, T10, TP2, TP12, TP13

**Packaging:** Exceptions: None **Non-bulk:** 158 **Bulk:** 243

**Quantity Limitations:** Passenger aircraft/rail: Forbidden **Cargo aircraft only:** 2.5 L

**Vessel Stowage:** Location: D **Other:** 44, 66, 89, 90, 110, 111



**Shipping Name and Description:** Nitric acid *other than red fuming, with not more than 70 percent nitric acid*

**ID:** UN2031

**Hazard Class:** 8 - Corrosive material

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 8 - Corrosive

**Special Provisions:** B2, B47, B53, IB2, T8, TP2, TP12

**Packaging:** Exceptions: None **Non-bulk:** 158 **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: Forbidden **Cargo aircraft only:** 30 L

**Vessel Stowage:** Location: D **Other:**



**Shipping Name and Description:** Nitric acid, red fuming

**ID:** UN2032

**Hazard Class:** 8 - Corrosive material

**Packing Group:** I - Great Danger

**Symbols:** + - Override definitions

**Label Codes:** 8 - Corrosive, 5.1 - Oxidizer, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*

**Special Provisions:** 2, B9, B32, B74, T20, TP2, TP12, TP13, TP38, TP45

**Packaging:** Exceptions: None **Non-bulk:** 227 **Bulk:** 244

**Quantity Limitations:** Passenger aircraft/rail: Forbidden **Cargo aircraft only:** Forbidden

**Vessel Stowage:** Location: D **Other:**



## Section 15 - Regulatory Information

### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Listed

**RQ:** 1000 lb

**TPQ:** 1000 lb

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# **Polychlorinated Biphenyls (PCBs)**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Polychlorinated Biphenyls (PCBs)

**CAS Number:** 1336-36-3

**Chemical Formula:** Unspecified or Variable

**Structural Chemical Formula:**  $(C_{12}H_{10-x})Cl_x$

**EINECS Number:** 215-648-1

**ACX Number:** X1004032-9

**Synonyms:** AROCLOR; AROCLOR 1221; AROCLOR 1232; AROCLOR 1242; AROCLOR 1248; AROCLOR 1254; AROCLOR 1260; AROCLOR 1262; AROCLOR 1268; AROCLOR 2565; AROCLOR 4465; AROCLOR 5442; 1,1'-BIPHENYL, CHLORO DERIVS; BIPHENYL, POLYCHLORO-; CHLOPHEN; CHLOREXTOL; CHLORINATED BIPHENYL; CHLORINATED DIPHENYL; CHLORINATED DIPHENYLENE; CHLORO 1,1-BIPHENYL; CHLORO 1,1-BIPHENYL-; CHLORO BIPHENYL; CLOPHEN; CLOPHEN A 60; DYKANOL; EPA PESTICIDE CHEMICAL CODE 017801; FENCLOR; FENCLOR 42; INERTEEN; KANECHLOR; KANECHLOR 300; KANECHLOR 400; MONTAR; MONTER; NOFLAMOL; PCB; PCBS; PHENOCHLOR; PHENOCOLOR; POLYCHLORINATED BIPHENYL; POLYCHLORINATED BIPHENYLS; POLYCHLORINATED BIPHENYLS (PCBS); POLYCHLOROBIPHENYL; PYRALENE; PYRANOL; SANTOTHERM; SANTOTHERM FR; SOVOL; THERMINOL; THERMINOL FR-1

**General Use:** Used as dielectric fluids in transformers and capacitors. Prior to 1972, were used as hydraulic and other industrial fluids (e.g., in vacuum pumps, as lubricants and cutting oils), in paints, inks and fire retardants.

Also used in heat transfer systems; gas-transmission turbines; carbonless reproducing paper; adhesives; as plasticizer in epoxy paints; fluorescent light ballasts; wax extenders; coolants; dedusting agents; pesticide extenders; surface treatment and coatings; sealants; caulking material.

This is one of a group of once widely used industrial chemicals whose high stability contributed both to their commercial usefulness and the long term deleterious environmental health effects. Consequently their use has been phased out. Their manufacture in the U.S.A. was discontinued in 1977.

## Section 2 - Composition / Information on Ingredients

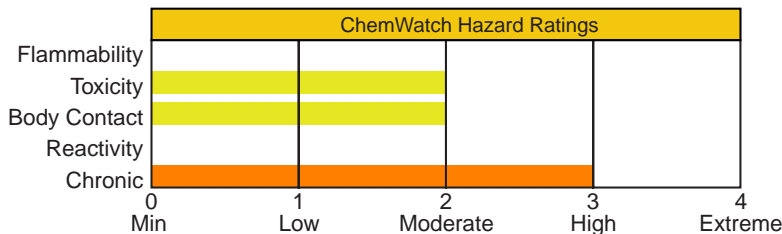
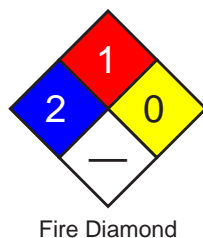
Name	CAS	%
polychlorinated biphenyls (PCB's)	1336-36-3	100

**OSHA PEL**

**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



HMIS	
2	Health
1	Flammability
0	Reactivity

**ANSI Signal Word**

**Warning!**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Oily liquid, white crystalline solid, or hard resin. Severely irritating. Suspect cancer hazard. Chronic Effects: chloracne, GI disturbances, neurological symptoms, liver enlargement, menstrual changes, bronchitis, possible reproductive/teratogenic effects.

### Potential Health Effects

**Target Organs:** skin, liver, eyes, mucous membranes, respiratory system

**Primary Entry Routes:** inhalation, skin contact, ingestion



**Acute Effects**

**Inhalation:** Not normally a hazard due to nonvolatile nature of product. Inhalation of vapor is more likely at higher than normal temperatures.

The vapor/mist is discomforting and may be extremely toxic if inhaled.

**Eye:** The vapor/liquid is moderately discomforting and may be harmful to the eyes.

**Skin:** The liquid is harmful to the skin, it is rapidly absorbed and is capable of causing skin reactions.

Exposure to material may result in a dermatitis, described as chloracne, a persistent acneiform characterized by comedones (white-, and black- heads), keratin cysts, and inflamed papules with hyperpigmentation and an anatomical distribution frequently involving the skin under the eyes and behind the ears. It occurs after acute or chronic exposure to a variety of chlorinated aromatic compounds by skin contact, ingestion or inhalation and may appear within days and months following the first exposure. Other dermatological alterations including hypertrichosis (the growth of excess hair), an increased incidence of actinic or solar elastosis (the degeneration of elastic tissue within muscles or loss of dermal elasticity produced by the effects of sunlight), and Peyrone's disease (a rare progressive scarring of the penile membrane).

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed in large quantity.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Digestion may lead to nausea, vomiting, abdominal pain, anorexia, jaundice and liver damage, coma and death.

Headache, dizziness, lethargy, depression, nervousness, loss of libido, muscle, joint pains may be found.

Symptoms appear after a latent period of 5 to 6 months.

PCB's may appear in breast milk of exposed mothers and in newborn infants.

**Carcinogenicity:** NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

**Chronic Effects:** People occupationally exposed to PCB's have relatively high PCB residue levels in blood plasma.

Symptoms include chloracne dermatitis and degreasing the skin, pigmentation of skin and nails, excessive eye discharge, swelling of eyelids, transient visual disturbances, distinctive hair follicles, edema of the face and hands.

In common with other polyhalogenated aromatic hydrocarbons, the chlorinated biphenyls exhibit dioxin-like behavior.

Polyhalogenated aromatic hydrocarbons (PHAHs) comprise two major groups.

The first group represented by the halogenated derivatives of dibenzodioxins (the chlorinated form is PCDD), dibenzofurans (PCDF) and biphenyls (PCB) exert their toxic effect (as hepatotoxicants, reproductive toxicants, immunotoxicants and procarcinogens) by interaction with a cytosolic protein known as the Ah receptor. In guinea pigs the Ah receptor is active in a mechanism which "pumps" PHAH into the cell whilst in humans the reverse appears to be true. This, in part, may account for species differences often cited in the literature. This receptor exhibits an affinity for the planar members of this group and carries these to the cellular nucleus where they bind, reversibly, to specific genomes on DNA.

This results in the regulation of the production of certain proteins which elicit the toxic response. The potency of the effect is dependent on the strength of the original interaction with the Ah receptor and is influenced by the degree of substitution by the halogen and the position of such substitutions on the parent compound.

The most potent molecule is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) while the coplanar PCBs (including mono-ortho coplanars) possess approximately 1% of this potency. Nevertheless, all are said to exhibit "dioxin-like" behavior and in environmental and health assessments it has been the practice to assign each a TCDD-equivalence value.

The most subtle and important biological effects of the PHAHs are the effects on endocrine hormones and vitamin homeostasis. TCDD mimics the effect of thyroxine (a key metamorphosis signal during maturation) and may disrupt patterns of embryonic development at critical stages. Individuals from exposed wildlife populations have been observed to have altered sexual development, sexual dysfunction as adults and immune system suppression.

Immunotoxic effects of the PHAHs (including the brominated congener, PBB) have been the subject of several studies. No clear pattern emerges in human studies however with T-cell numbers and function (a blood marker for immunological response) increasing in some and decreasing in others.

Three incidences have occurred which have introduced abnormally high levels of dioxin or dioxin-like congeners to humans. The explosion at a trichlorophenol-manufacturing plant in Seveso, Italy distributed TCDD across a large area of the country-side, whilst rice-oil contaminated with heat-transfer PCBs (and dioxin-like contaminants) has been consumed by two groups, on separate occasions (one in Yusho, Japan and another in Yu-cheng, Taiwan). The only symptom which can unequivocally be related to all these exposures is the development of chloracne, a disfiguring skin condition, following each incident. Contaminated oil poisonings also produced eye-discharge, swelling of eyelids and visual disturbances. The Babies born up to 3 years after maternal exposure (so-called "Yusho-babies") were characteristically brown skinned, colored gums and nails and (frequently) produced eye-discharges. Delays in intellectual development have been noted. It has been estimated that Yu-cheng patients consumed an average level of 0.06 mg/kg body weight/day total PCB and 0.0002 mg/kg/day of PCDF before the onset of symptoms after 3 months. When the oil was withdrawn after 6 months they had consumed 1 gm total PCB containing 3.8 mg PCDF.



Preliminary data from the Yusho cohort suggests a six-fold excess of liver cancer mortality in males and a three-fold excess in women.

Recent findings from Seveso indicate that the biological effects of low level exposure (BELLEs), experienced by a cohort located at a great distance from the plant, may be hormetic, i.e. may be protective AGAINST the development of cancer.

TCDD induces carcinogenic effects in the laboratory in all species, strains and sexes tested. These effects are dose-related and occur in many organs.

Exposures as low as 0.001 ug/kg body weight/day produce carcinoma.

Several studies implicate PCBs in the development of liver cancer in workers as well as multi-site cancers in animals.

The second major group of PHAH consists of the non-planar PCB congeners which possess two or more ortho-substituted halogens. These have been shown to produce neurotoxic effects which are thought to reduce the concentration of the brain neurotransmitter, dopamine, by inhibiting certain enzyme-mediated processes.

The specific effect elicited by both classes of PHAH seems to depend on the as much on the developmental status of the organism at the time of the exposure as on the level of exposure over a lifetime.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

**Eye Contact:** Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Treat symptomatically. If large amounts are ingested, gastric lavage is suggested. For splash in the eyes, a petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs. If electrical equipment arcs over, PCB dielectric fluids may decompose to produce hydrogen chloride (HCl), a respiratory irritant. [Monsanto] Preplacement and annual medical examinations of workers, with emphasis on liver function, skin condition, reproductive history, is recommended.

See  
DOT  
ERG

## Section 5 - Fire-Fighting Measures

**Flash Point:** > 141 °C

**Autoignition Temperature:** 240 °C

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** Foam. Alcohol stable foam.

Dry chemical powder.

**General Fire Hazards/Hazardous Combustion Products:** Noncombustible liquid.

POLLUTANT -contain spillage.

Decomposes on heating and produces acrid black soot and toxic fumes of aldehydes, hydrogen chloride (HCl), chlorides and extremely toxic polychlorinated dibenzofuran (PCDF), polychlorinated dibenzodioxin (PCDD).

**Fire Incompatibility:** Reacts vigorously with chlorine (Cl<sub>2</sub>).

**Fire-Fighting Instructions:** POLLUTANT -contain spillage. Noncombustible.

Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

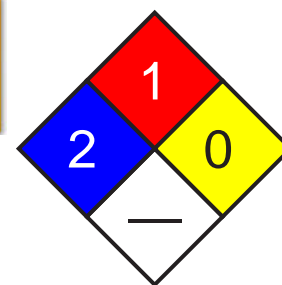
Cool fire-exposed containers with water spray from a protected location.

Avoid spraying water onto liquid pools.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.

See  
DOT  
ERG



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** POLLUTANT -contain spillage. Clean up all spills immediately.

Environmental hazard - contain spillage.

Avoid breathing vapors and contact with skin and eyes.

Wear protective clothing, impervious gloves and safety glasses.

Contain spill with sand, earth or vermiculite.

Wipe up and absorb small quantities with vermiculite or other absorbent material.

Place spilled material in clean, dry, sealable, labeled container.

**Large Spills:** POLLUTANT -contain spillage. Clear area of personnel.

Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Stop leak if safe to do so.

Contain spill with sand, earth or vermiculite.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect residues and seal in labeled drums for disposal.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

If equipment is grossly contaminated, decontaminate and destroy.

If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** Do not allow clothing wet with material to stay in contact with skin Use good occupational work practices. Observe manufacturer's storing and handling recommendations.

Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Avoid all personal contact, including inhalation.

Wear protective clothing and gloves when handling containers.

Avoid physical damage to containers.

Use in a well-ventilated area and Use only in completely enclosed system.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Wash hands with soap and water after handling.

Work clothes should be laundered separately: NOT at home.

**Recommended Storage Methods:** Packaging as recommended by manufacturer.

Check that containers are clearly labeled.

Metal can or metal drum or Steel drum with plastic liner.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Provide adequate ventilation in warehouse or closed storage areas.

If inhalation risk of overexposure exists, wear NIOSH-approved organic-vapor respirator.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; chemical goggles.

Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Impervious gloves or Viton gloves or Polyethylene gloves or PVC gloves.

Protective footwear.

**Other:** Impervious protective clothing. Overalls. Impervious apron.

Eyewash unit.

Ensure there is ready access to a safety shower.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear, colorless to yellow-green, mobile oily to viscous liquid, or sticky to hard resin, or white crystalline solid, depending on degree of chlorination. Slightly soluble in glycerol and glycols. Soluble in organic solvents and lipids. Viscosity range: 71 - 2500 Saybolt unit sec. at 38 °C. PCBs are resistant to chemical and biological degradation and because of their solubility in fats and oils they tend to be concentrated in living organisms. The highly chlorinated PCBs are retained in animal's bodies longer and seems to delay the excretion of the lower chlorinated PCB's. They have become widely dispersed in the world-wide environment and in the food-chain since their introduction in 1929. They are now recognized internationally to be a major environmental pollutant, their persistence causing ecological damage via water pollution. Consequently loss of PCBs to the environment is to be avoided at all costs.

**Physical State:** Liquid

**Vapor Pressure (kPa):** Negligible

**Formula Weight:** 188.66 - 395

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.18 - 1.8

**Evaporation Rate:** Non Vol. at 38 °C

**pH:** Not applicable

**pH (1% Solution):** Not applicable.

**Boiling Point:** 340 °C (644 °F) to 375 °C (707 °F)

**Decomposition Temperature (°C):** 375-550

**Water Solubility:** Solubility in water extremely low

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Avoid storage with oxidizers. Segregate from chlorine.

Avoid contamination of water, foodstuffs, feed or seed.

## Section 11 - Toxicological Information

### Toxicity

Oral (human) LD<sub>50</sub>: 500 mg/kg

Oral (rat) LD<sub>50</sub>: 3980 mg/kg

### Irritation

Nil reported

See RTECS TQ1350000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** PCBs are mixtures of different congeners of chlorobiphenyl and the relative importance of the environmental fate mechanisms generally depends on the degree of chlorination. In general, the persistence of PCBs increases with an increase in the degree of chlorination. Mono-, di- and trichlorinated biphenyls (Aroclor 1221 and 1232) biodegrade relatively rapidly, tetrachlorinated biphenyls (Aroclors 1016 and 1242) biodegrade slowly, and higher chlorinated biphenyls (Aroclors 1248, 1254, and 1260) are resistant to biodegradation. Although biodegradation of higher chlorinated congeners may occur very slowly on an environmental basis, no other degradation mechanisms have been shown to be important in natural water and soil systems; therefore, biodegradation may be the ultimate degradation process in water and soil.

If released to soil, PCBs experience tight adsorption with adsorption generally increasing with the degree of chlorination. PCBs will generally not leach significantly in aqueous soil systems; the higher chlorinated congeners will have a lower tendency to leach than the lower chlorinated congeners. In the presence of organic solvents PCBs may leach quite rapidly through soil. Vapor loss from soil surfaces appears to be an important fate mechanism with the rate of volatilization decreasing with increasing chlorination. Although the volatilization rate may be low, the total loss by volatilization over time may be significant because of persistence and stability. Enrichment of the low Cl PCBs occurs in the vapor phase relative to the original Aroclor; the residue will be enriched in the PCBs containing high Cl content. If released to water, adsorption to sediment and suspended matter will be an important fate process; PCB concentrations in sediment and suspended matter have been shown to be greater than in the associated water column. Although adsorption can immobilize PCBs (especially the higher chlorinated congeners) for relatively long periods of time, eventual resolution into the water column has been shown to occur. The PCB composition in the water will be enriched in the lower chlorinated PCBs because of their greater water solubility, and the least water soluble PCBs (highest Cl content) will remain adsorbed. In the absence of adsorption, PCBs volatilize relatively rapidly from water. However, strong PCB adsorption to sediment significantly competes with volatilization, with the higher chlorinated PCBs having longer half-lives than the lower chlorinated PCBs. Although the resulting volatilization rate may be low, the total loss by volatilization over time may be significant because of persistence and stability. PCBs have been shown to bioconcentrate significantly in aquatic organisms. If released to the atmosphere, PCBs will primarily exist in the vapor-phase; the tendency to become associated with the particulate-phase will increase as the degree of chlorination of the PCB increases. The dominant atmospheric transformation process is probably the vapor-phase reaction with hydroxyl radicals which has estimated half-lives ranging from 12.9 days for monochlorobiphenyl to 1.31 years for heptachlorobiphenyl. Physical removal from the atmosphere, which is very important environmentally, is accomplished by wet and dry deposition.

**Ecotoxicity:** Aquatic toxicity: 0.278 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water 0.005 ppm/336-1080 hr/pinfish/TL<sub>m</sub>/salt water;  
 Waterfowl toxicity: LD<sub>50</sub> 2000 ppm (mallard duck); Food chain concentration potential: High  
**Henry's Law Constant:**  $5 \times 10^{-5}$   
**BCF:** bioconcentrate in tissue  
**Biochemical Oxygen Demand (BOD):** very low  
**Soil Sorption Partition Coefficient:**  $K_{oc} = 510$  to  $1.33 \times 10^4$

### Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible. Consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Due to their environmental persistence and potential health hazards, PCBs cannot be disposed of in landfills or dumped at sea. The only environmentally acceptable method for the disposal of PCBs is by high temperature incineration.

All wastes and residues containing PCB's (e. g. , wiping cloths, absorbent material, used disposable protective gloves, contaminated clothing, etc. ) should be collected, placed in proper containers, labelled and disposed of in accordance with applicable regulations.

### Section 14 - Transport Information

#### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Polychlorinated biphenyls, liquid

**ID:** UN2315

**Hazard Class:** 9 - Miscellaneous hazardous material

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 9 - Class 9

**Special Provisions:** 9, 81, 140, IB3, T4, TP1

**Packaging:** Exceptions: 155 **Non-bulk:** 202 **Bulk:** 241

**Quantity Limitations:** Passenger aircraft/rail: 100 L **Cargo aircraft only:** 220 L

**Vessel Stowage:** Location: A **Other:** 95



**Shipping Name and Description:** Polychlorinated biphenyls, solid

**ID:** UN2315

**Hazard Class:** 9 - Miscellaneous hazardous material

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 9 - Class 9

**Special Provisions:** 9, 81, 140, IB7

**Packaging:** Exceptions: 155 **Non-bulk:** 212 **Bulk:** 240

**Quantity Limitations:** Passenger aircraft/rail: 100 kg **Cargo aircraft only:** 200 kg

**Vessel Stowage:** Location: A **Other:**



### Section 15 - Regulatory Information

#### EPA Regulations:

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1 lb (0.454 kg)

**SARA 40 CFR 372.65:** Listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# **Sodium Hydroxide**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Sodium Hydroxide

**CAS Number:** 1310-73-2

**Chemical Formula:** HNaO

**Structural Chemical Formula:** NaOH

**EINECS Number:** 215-185-5

**ACX Number:** X1000118-8

**Synonyms:** CAUSTIC SODA; CAUSTIC SODA,BEAD; CAUSTIC SODA,DRY; CAUSTIC SODA,FLAKE; CAUSTIC SODA,GRANULAR; CAUSTIC SODA,SOLID; HYDROXYDE DE SODIUM; LEWIS-RED DEVIL LYE; LYE; NATRIUMHYDROXID; NATRIUMHYDROXYDE; SODA LYE; SODA,CAUSTIC; SODA,HYDRATE; SODIO(IDROSSIDO DI); SODIUM HYDRATE; SODIUM HYDROXIDE; SODIUM HYDROXIDE,BEAD; SODIUM HYDROXIDE,DRY; SODIUM HYDROXIDE,FLAKE; SODIUM HYDROXIDE,GRANULAR; SODIUM HYDROXIDE,SOLID; SODIUM(HYDROXYDE DE); WHITE CAUSTIC

**General Use:** Component of alkali cleaners. Manufacture of soap, pulp and paper; rayon. Chemical manufacture. Neutralizing agent in petroleum refining; manufacture of aluminum, detergents, textile processing, refining of vegetable oils. Laboratory reagent, for organic fusion, etching of metal. Used for regenerating ion exchange resins, lye peeling of fruits and vegetables in the food industry.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
sodium hydroxide	1310-73-2	>98

### OSHA PEL

TWA: 2 mg/m<sup>3</sup>.

### NIOSH REL

Ceiling: 2 mg/m<sup>3</sup>.

### OSHA PEL Vacated 1989 Limits

STEL: 2 mg/m<sup>3</sup>; Ceiling.

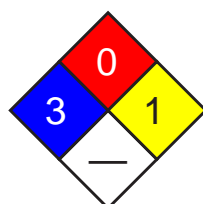
### IDLH Level

10 mg/m<sup>3</sup>.

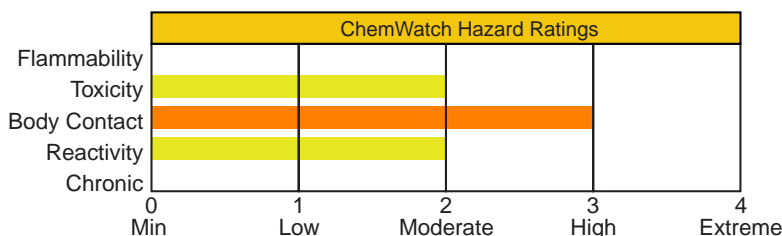
### ACGIH TLV

Ceiling: 2 mg/m<sup>3</sup>.

## Section 3 - Hazards Identification



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### ANSI Signal Word

**Danger!**

HMIS	
3	Health
1	Flammability
0	Reactivity



Corrosive

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White, odorless, hygroscopic flakes, lumps, or pellets. Corrosive, causes severe burns to eyes/skin/respiratory tract. Chronic Effects: dermatitis. Reacts with water.

### Potential Health Effects

**Target Organs:** eyes, digestive system, respiratory system, skin

**Primary Entry Routes:** ingestion, inhalation, skin contact, eye contact

#### Acute Effects

**Inhalation:** Generated dust may be highly discomforting and corrosive to the upper respiratory tract if inhaled and is capable of causing severe burns to the upper respiratory tract.

The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.

Severe acute dust inhalation exposure may be fatal due to spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and severe pulmonary edema.

Symptoms of overexposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

**Eye:** The solid/dust is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

**Skin:** The solid/dust is highly discomforting and extremely corrosive to the skin and is capable of causing severe burns and ulceration.

Bare unprotected skin should not be exposed to this material. The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Burns are not immediately painful; onset of pain may be delayed minutes or hours; thus care should be taken to avoid contamination of gloves and boots. A 5% aqueous solution applied to the skin of rabbits for 4 hours produced severe necrosis. Instillation of a 1% solution into the conjunctival sac failed to produce ocular or conjunctival injury in rabbits provided the eye was promptly irrigated with copious amounts of water.

**Ingestion:** Considered an unlikely route of entry in commercial/industrial environments.

The solid is extremely corrosive to the gastrointestinal tract and may be fatal if swallowed.

Ingestion may result in severe burns to the mouth, throat and stomach, pain, nausea and vomiting, swelling of the larynx and subsequent suffocation, perforation of the gastrointestinal tract.

A 1% aqueous solution (pH 13.4) failed to cause gastric, esophageal or other damage in rabbits.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.

## Section 4 - First Aid Measures

**Inhalation:** If dust is inhaled, remove to fresh air. Encourage patient to blow nose to ensure clear breathing passages. Ask patient to rinse mouth with water but to not drink water. Seek immediate medical attention.

**Eye Contact:** DO NOT delay. Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** DO NOT delay. Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

In case of burns: Quickly immerse affected area in cold running water for 10 to 15 minutes. Bandage lightly with a sterile dressing. Treat for shock if required. Lay patient down. Keep warm and rested. Transport to hospital or doctor.

**Ingestion:** DO NOT delay. Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For acute or short-term repeated exposures to highly alkaline materials:

1. Respiratory stress is uncommon but presents occasionally because of soft tissue edema.
2. Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
3. Oxygen is given as indicated.
4. The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
5. Alkali corrosives damage occurs by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue. Alkalis continue to cause damage after exposure.

**INGESTION:**

1. Milk and water are the preferred diluents. No more than 2 glasses of water should be given to an adult.
2. Neutralizing agents should never be given since exothermic heat reaction may compound injury.

\* Catharsis and emesis are absolutely contra-indicated.

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\* Activated charcoal does not absorb alkali.

\* Gastric lavage should not be used.

Supportive care involves the following.

1. Withhold oral feedings initially.

2. If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.

3. Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.

4. Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).

SKIN AND EYE: Injury should be irrigated for 20-30 minutes. Eye injuries require saline.

## Section 5 - Fire-Fighting Measures

**Extinguishing Media:** Use extinguishing media suitable for surrounding area.

**General Fire Hazards/Hazardous Combustion Products:** Noncombustible.

Not considered to be a significant fire risk, however containers may burn.

Solid in contact with water or moisture reacts violently, and solutions are highly alkaline and may cause severe skin burns.

**Fire Incompatibility:** Avoid reaction with strong oxidizers, strong acids, organic materials/compounds.

In presence of moisture, the material is corrosive to aluminum, zinc and tin producing highly flammable hydrogen gas.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

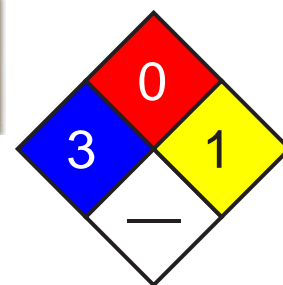
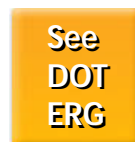
Do not approach containers suspected to be hot.

Cool fire exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Avoid spraying water onto liquid pools.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** DO NOT touch the spill material. Slippery when spilt.

Clean up all spills immediately.

Control personal contact by using protective equipment.

Use dry clean up procedures and avoid generating dust.

Place in suitable containers for disposal.

**Large Spills:** DO NOT touch the spill material. Slippery when spilt.

Keep dry. Reacts violently with water.

Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Shut off all possible sources of ignition and increase ventilation.

Stop leak if safe to do so.

Use dry clean up procedures and avoid generating dust. Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.

Wash area down with large quantity of water and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

After clean up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).



## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing dust. Avoid contact with skin and eyes.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards, otherwise PPE is required.

Handle and open container with care.

Keep dry. Reacts violently with water.

**WARNING:** Contact with water generates heat.



Avoid contact with incompatible materials.

Avoid physical damage to containers.

Keep containers securely sealed when not in use.

Always wash hands with soap and water after handling. Work clothes should be laundered separately. Launder contaminated clothing before reuse. Use good occupational work practice. Observe manufacturer's storing and handling recommendations.

Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

**Recommended Storage Methods:** Plastic bag or Packaging as recommended by manufacturer. Glass container.

Polyethylene or polypropylene container or Polylined drum.

DO NOT use aluminum, galvanized or tin-plated containers.

Check that containers are clearly labeled.

**Storage Requirements:** Keep dry. Reacts violently with water.

Store in original containers. Keep containers securely sealed. Store in a cool, dry, well-ventilated area. Store away from incompatible materials and foodstuff containers. Protect containers against physical damage and check regularly for leaks.

Observe manufacturer's storing and handling recommendations.

DO NOT use aluminum, galvanized or tin-plated containers.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Use in a well-ventilated area DO NOT handle directly. Wear gloves and use scoop/tongs/tools.

If risk of overexposure exists, wear NIOSH approved respirator.

If conditions are such that worker exposure potential is high, wear full-face air-supplied breathing apparatus and full protective suit.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** DO NOT handle directly. Wear gloves and use scoop/tongs/tools.

Elbow length PVC gloves or Butyl rubber gloves or Neoprene rubber gloves.

Safety footwear.

**Respiratory Protection:**

Exposure Range >2 to <10 mg/m<sup>3</sup>: Air Purifying, Negative Pressure, Half Mask

Exposure Range 10 to unlimited mg/m<sup>3</sup>: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

**Other:** Overalls. PVC apron. PVC protective suit may be required if exposure severe.

Eyewash unit. Ensure there is ready access to a safety shower.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** White hygroscopic, odorless, pellets, flakes, sticks or solid cast mass. Explosive boiling and spitting will occur if added to hot water. Reacts violently with acids. CAUSTIC alkali. Soluble in alcohol, ether, glycerol.

**Physical State:** Divided solid

**pH (1% Solution):** 12.7

**Vapor Pressure (kPa):** Negligible

**Boiling Point:** 1390 °C (2534 °F)

**Formula Weight:** 40

**Freezing/Melting Point:** 318.4 °C (605.12 °F)

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 2.12 at 20 °C

**Water Solubility:** 1 g dissolves in 0.9 ml water

**pH:** Not applicable

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Vigorously exotherms when mixed with water. In the presence of moisture, highly corrosive to aluminum, zinc and tin.

HIGHLY reactive: with ammonium salts evolves ammonia gas. Rapidly picks up moisture from the air and with carbon dioxide in air forms sodium carbonate.

Presence of incompatible materials and storage in unsealed containers.

Product is considered stable under normal handling conditions.

Hazardous polymerization will not occur.

**Storage Incompatibilities:** Keep dry. Reacts violently with water.

Segregate from water, strong oxidizers, strong acids, organic materials, ammonium compounds, nitro compounds and trichlorethylene.

## Section 11 - Toxicological Information

### Toxicity

No data reported

### Irritation

Skin (rabbit): 500 mg/24h SEVERE

Eye (rabbit): 0.05 mg/24h SEVERE

Eye(rabbit):1 mg/24h SEVERE

Eye(rabbit):1 mg/30s rinsed-SEVERE

See RTECS WB 4900000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** No data found.

**Ecotoxicity:** LC<sub>100</sub> Cyprinus carpio 180 ppm/24 hr at 25 deg; TL<sub>m</sub> mosquito fish 125 ppm/96 hr (freshwater) ; TL<sub>m</sub> Bluegill 99 mg/L/48 hr (tap water)

**Biochemical Oxygen Demand (BOD):** none

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = too low to be measured

## Section 13 - Disposal Considerations

**Disposal:** Recycle wherever possible or consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Treat and neutralize with dilute acid at an effluent treatment plant.

Recycle containers, otherwise dispose of in an authorized landfill.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Shipping Name and Description:** Sodium hydroxide, solid

**ID:** UN1823

**Hazard Class:** 8 - Corrosive material

**Packing Group:** II - Medium Danger

**Symbols:**

**Label Codes:** 8 - Corrosive

**Special Provisions:** IB8, IP2, IP4

**Packaging:** Exceptions: 154 Non-bulk: 212 Bulk: 240

**Quantity Limitations:** Passenger aircraft/rail: 15 kg Cargo aircraft only: 50 kg

**Vessel Stowage:** Location: A Other:



## Section 15 - Regulatory Information

### **EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

## Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# **Sodium Thiosulfate**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

54/60

**Material Name:** Sodium Thiosulfate

**CAS Number:** 7772-98-7

**Chemical Formula:** Na<sub>2</sub>O<sub>3</sub>S<sub>2</sub>

**EINECS Number:** 231-867-5

**ACX Number:** X1000149-3

**Synonyms:** AMETOX; ANTICHLOR; CHLORINE CONTROL; CHLORINE CURE; DECLOR-IT; DISODIUM SALT; DISODIUM THIOSULFATE; S-HYDRIL; HYPO; SODIUM HYPOSULFITE; SODIUM OXIDE SULFIDE; SODIUM THIOSULFATE; SODIUM THIOSULFATE ANHYDROUS; SODIUM THIOSULPHATE; SODOTHIOIOL; SULFOTHIORINE; THIOSULFURIC ACID,DISODIUM SALT

**General Use:** Used widely as bleaching agent, an ingredient in photographic fixer solutions, for extraction of silver from ores, as a mordant in dyeing and printing textiles, reducers in chrome dyeing, in leather manufacture and a reagent in analytical and organic chemistry.

Antidote for cyanide poisoning.

## Section 2 - Composition / Information on Ingredients

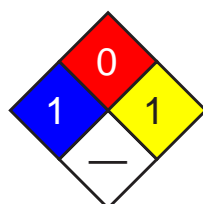
Name	CAS	%
sodium thiosulfate	7772-98-7	>98

**OSHA PEL**

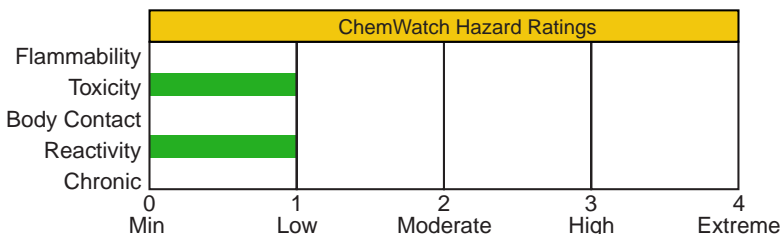
**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
0	Flammability
0	Reactivity

**ANSI Signal Word**

**Caution**

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White powder or crystals; almost odorless. Mildly irritating to eyes/skin/respiratory tract. Also causes: nausea, abdominal cramping, diarrhea, GI irritation, allergic contact dermatitis. Chronic effects: chronic dermatitis.

### Potential Health Effects

**Target Organs:** skin, eyes, mucous membranes, upper respiratory system, gastrointestinal (GI) tract

**Primary Entry Routes:** inhalation, ingestion

#### Acute Effects

**Inhalation:** The dust may be discomforting to the upper respiratory tract.

Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.

**Eye:** The material is moderately discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

**Skin:** The material is moderately discomforting to the skin.

Solution of material in moisture on the skin or in perspiration may increase irritant effects.

Open cuts, abraded or irritated skin should not be exposed to this material.

**Ingestion:** The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed in large quantity.

Ingestion can cause irritation of the gastrointestinal tract and purging.

Diarrhea may occur from ingestion of large quantities. In treatment of cyanide poisoning, 12.5 gm. has been injected intravenously without ill-effect.

Thiosulfate salts are poorly absorbed from the alimentary tract and as a consequence act as an osmotic cathartic.

Absorbed thiosulfates are remarkably inert and are distributed in extracellular fluids where they may cause osmotic disturbances.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

**Chronic Effects:** No human exposure data available. For this reason, health effects described are based on experience with chemically-related materials.

## Section 4 - First Aid Measures

**Inhalation:** Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Seek medical attention if irritation or discomfort persist.

**Eye Contact:** Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

**Ingestion:** Rinse mouth out with plenty of water.

Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Treat symptomatically.

## Section 5 - Fire-Fighting Measures

**Autoignition Temperature:** Not applicable

**LEL:** Not applicable

**UEL:** Not applicable

**Extinguishing Media:** There is no restriction on the type of extinguisher which may be used.

**General Fire Hazards/Hazardous Combustion Products:** The material is not readily combustible under normal conditions. However, it will breakdown under fire conditions and the organic component may burn.

Not considered to be a significant fire risk.

Heating may cause expansion and violent bursting - rupture of containers.

May emit acrid smoke.

Decomposition will occur at high temperatures and may produce fumes of Flammable hydrogen sulfide (H<sub>2</sub>S).

**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

**Fire-Fighting Instructions:** Contact fire department and tell them location and nature of hazard.

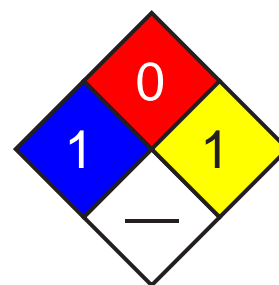
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.



Fire Diamond

## Section 6 - Accidental Release Measures

**Small Spills:** Clean up all spills immediately. Avoid contact with skin and eyes.

Wear impervious gloves and safety glasses.

Use dry clean-up procedures and avoid generating dust.

Vacuum up or sweep up.

Place spilled material in clean, dry, sealable, labeled container.

**Large Spills:** Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Stop leak if safe to do so.  
 Contain spill with sand, earth or vermiculite.  
 Collect recoverable product into labeled containers for recycling.  
 Neutralize/decontaminate residue.  
 Collect solid residues and seal in labeled drums for disposal.  
 Wash area and prevent runoff into drains.  
 After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.  
 If contamination of drains or waterways occurs, advise emergency services.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Avoid generating and breathing dust. Limit all unnecessary personal contact.

Wear protective clothing when risk of exposure occurs.  
 Use in a well-ventilated area. When handling DO NOT eat, drink or smoke.  
 Always wash hands with soap and water after handling.  
 Avoid physical damage to containers. Use good occupational work practices.  
 Observe manufacturer's storing and handling recommendations.

**Recommended Storage Methods:** Check that containers are clearly labeled.

Packaging as recommended by manufacturer.  
 Glass container or Plastic container or Plastic drum or Polylined drum.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** General exhaust is adequate under normal operating conditions.

If risk of overexposure exists, wear NIOSH-approved dust respirator.  
 Correct fit is essential to obtain adequate protection.

**Personal Protective Clothing/Equipment:**

**Eyes:** Safety glasses with side shields; or as required, chemical goggles.  
 Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

**Hands/Feet:** Neoprene rubber gloves or rubber gloves or PVC gloves.  
 Protective footwear.

**Other:** Overalls. Barrier cream.  
 Ensure that there is ready access to eye wash unit.

**Glove Selection Index:**

NATURAL RUBBER..... Best selection  
 NEOPRENE..... Best selection  
 NITRILE..... Best selection  
 NITRILE+PVC..... Best selection  
 PVC..... Best selection

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Clear to white crystals or granules with no odor. Insoluble in alcohol. Slowly decomposes in aqueous solution.

**Physical State:** Divided solid

**Vapor Pressure (kPa):** Not applicable

**Vapor Density (Air=1):** Not applicable

**Formula Weight:** 158.10

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 1.7

**Evaporation Rate:** Not applicable

**pH:** Not applicable

**pH (1% Solution):** 6.5-8.0 (5% sol)

**Boiling Point:** 100 °C (212 °F)

**Freezing/Melting Point:** 48 °C (118.4 °F)

**Volatile Component (% Vol):** Negligible

**Decomposition Temperature (°C):** >100 C

**Water Solubility:** Practically insoluble in water

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Product is considered stable. Hazardous polymerization will not occur.

**Storage Incompatibilities:** Contact with acids produces toxic fumes, i.e. sulfur dioxide (SO<sub>2</sub>).

Avoid storage with acids, metal nitrites, sodium nitrite, halogens and oxidizing agents.

**Section 11 - Toxicological Information****Toxicity**

Oral (human) TD<sub>Lo</sub>: 300 mg/kg/7d

**Irritation**

Nil reported

See RTECS XN 6476000, for additional data.

**Section 12 - Ecological Information**

**Environmental Fate:** No data found.

**Ecotoxicity:** No data found.

**Section 13 - Disposal Considerations**

**Disposal:** Recycle wherever possible or consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Bury residue in an authorized landfill.

Recycle containers where possible, or dispose of in an authorized landfill.

Small quantities may be discharged to sewer with a large excess of water.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):**

**Shipping Name and Description:** None

**Section 15 - Regulatory Information****EPA Regulations:**

**RCRA 40 CFR:** Not listed

**CERCLA 40 CFR 302.4:** Not listed

**SARA 40 CFR 372.65:** Not listed

**SARA EHS 40 CFR 355:** Not listed

**TSCA:** Listed

**Section 16 - Other Information**

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**2, 3, 7, 8-Tetrachlorodibenzo-*p*-dioxin**



Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

44/60

**Material Name:** 2, 3, 7, 8-Tetrachlorodibenzo-*p*-dioxin

**CAS Number:** 1746-01-6

**Chemical Formula:** C<sub>12</sub>H<sub>4</sub>Cl<sub>4</sub>O<sub>2</sub>

**EINECS Number:** 217-122-7

**ACX Number:** X1002670-1

**Synonyms:** 2,3,7,8-CZTEROCHLORODWUBENZO-P-DWUOKSYNY; DIBENZO(B,E)(1,4)DIOXIN,2,3,7,8-TETRACHLORO-; DIBENZO-P-DIOXIN,2,3,7,8-TETRACHLORO-; DIOKSINY; DIOXIN; DIOXIN (HERBICIDE CONTAMINANT); DIOXINE; TCDBD; 2,3,7,8-TCDD; TCDD; 2, 3, 7, 8-TETRACHLORODIBENZO-P-DIOXIN; 2,3,7,8-TETRACHLORODIBENZO(B,E)(1,4)DIOXAN; 2, 3, 7, 8-TETRACHLORODIBENZO-P-DIOXIN; 2,3,6,7-TETRACHLORODIBENZO-P-DIOXIN; 2,3,7,8-TETRACHLORODIBENZO(B,E)(1,4)DIOXIN; 2,3,7,8-TETRACHLORODIBENZO-1,4-DIOXIN; 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN; TETRACHLORODIBENZODIOXIN; 2,3,6,7-TETRACHLORODIBENZODIOXIN; TETRADIOXIN

**Derivation:** TCDD is not manufactured, but is formed as a by-product of chlorobenzenes, chlorophenols, and the herbicides 2, 4, 5-trichlorophenoxyacetic acid (2, 4, 5-T) and 2-(2, 4, 5-trichlorophenoxy)propionic acid (Silvex) which are produced from 2, 4, 5-trichlorophenol (TCP). 2, 4, 5-T, commonly known as Agent Orange, was the defoliant used during the Vietnam War. TCP, 2, 4, 5-T and Silvex are no longer commercially produced in the U.S. As a chemical and toxicological standard, TCDD can be prepared by catalytic condensation of potassium 2, 4, 5-trichlorophenate. TCDD has been released to the environment during the incineration of chemical wastes including chlorinated benzenes, chlorophenols, and biphenyl ethers, from the improper disposal of certain chlorinated chemical wastes, in emissions from wood burning in the presence of chlorine, in accidental fires involving transformers containing PCBs, and from the use of the herbicides 2, 4, 5-T and Silvex.

**General Use:** TCDD is an extremely toxic, unwanted by-product and essentially has no beneficial uses. It may be used as a research chemical.

## Section 2 - Composition / Information on Ingredients

Name	CAS	%
2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin	1746-01-6	ca 100% wt.

**Trace Impurities:** TCDD normally persists as a contaminant in TCP in variable amounts (0.07-6.2 mg/kg). Consequently, the concentrations of TCDD in different batches of Agent Orange varied greatly with an average concentration of about 2 ppm.

**OSHA PEL**

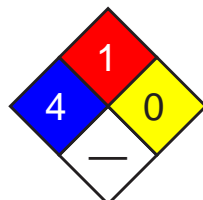
**NIOSH REL**

**DFG (Germany) MAK**

TWA: 10 µg/m<sup>3</sup>; PEAK: 80 µg/m<sup>3</sup>; skin; measured as inhalable fraction of the aerosol.

**ACGIH TLV**

## Section 3 - Hazards Identification



Fire Diamond

ChemWatch Hazard Ratings				
Flammability				
Toxicity				
Body Contact				
Reactivity				
Chronic				
	0	1	2	3
	Min	Low	Moderate	High
				4
				Extreme

**ANSI Signal Word**

**Danger!**

HMIS	
4	Health
1	Flammability
0	Reactivity



Poison



Corrosive

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, crystalline solid. Corrosive. Poison. Other Acute Effects: chloracne, metabolic disorders, nervous system/liver damage. Chronic Effects: teratogenesis/tumorigenesis/immunological dysfunction (animal data). Potential human carcinogen.

### Potential Health Effects

**Target Organs:** Skin, liver, and nervous system.

**Primary Entry Routes:** Inhalation (dust),\* skin contact, ingestion.

**Acute Effects** The observed health effects from clinical or epidemiological studies of populations who were occupationally and non-occupationally exposed cannot be solely attributed to TCDD because of the concurrent exposure to 2, 4, 5-T and TCP and to other herbicides as well. There is no report of human exposure to TCDD alone.

**Inhalation:** Shortness of breath, headaches, fatigue, severe muscle pains, weakness, and digestive disturbance. Most symptoms develop slowly, over many days.

**Eye:** Conjunctivitis and chemical burns.

**Skin:** Chemical burns. In most cases, chloracne appears within 2 to 4 weeks after initial exposure. It consists of blackheads with small, pale-yellow cysts. In severe cases, there may be papules (red spots) or even pustules (pus-filled spots). This acne-like rash appears on the cheekbones under the eyes and behind the ears in very mild cases. With increasing severity, the rest of the face and neck are affected and the outer upper arms, chest, back, abdomen, outer thighs and genitalia may be involved in varying degrees in the worst cases. In the worst cases, lesions may be active 15 or more years after the contact has ceased. Chloracne may also appear after ingestion or inhalation. Skin fragility, hirsutism (excessive growth of hair of normal or abnormal distribution), and photosensitivity may also occur.

**Ingestion:** Nausea, vomiting, and possible pancreatitis.

**Carcinogenicity:** NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Not listed; EPA - Not listed; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

**Medical Conditions Aggravated by Long-Term Exposure:** Skin, liver, nervous and endocrine system disorders.

**Chronic Effects:** Lack of energy, loss of sex drive, personality and mood changes, numbness, weakness and pain in the legs, liver damage, chloracne, and elevated blood lipids. TCDD increased the incidence of a variety of tumors in animals, but human data is inconclusive. Little is known of the human health effects (if any) as a result of long-term exposures to low concentrations.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin Contact:** *Quickly* remove contaminated clothing. Flush with water to remove solid particles; follow with a soap and water wash of exposed areas. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For an acute exposure, obtain liver function tests, CBC, prothrombin time, serum lipids, and uroporphyrins. EMG may be useful in detecting subclinical neuropathy. Current analytical techniques to detect dioxins in human tissue specimens involve gas chromatography and mass spectrometry. Chloracne may respond to topical retinoic acid, and oral tetracyclines may help secondary pustular follicles. Resistant cases may require dermabrasion or acne surgery. Isotretinoin may be tried.

**Special Precautions/Procedures:** Emergency personnel should protect against contamination.

See  
DOT  
ERG

### Section 5 - Fire-Fighting Measures

**Flash Point:** None reported.

**Autoignition Temperature:** None reported.

**LEL:** None reported.

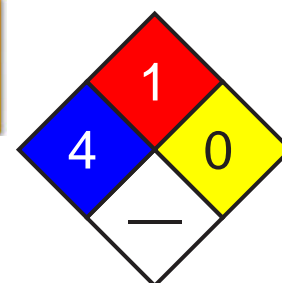
**UEL:** None reported.

**Extinguishing Media:** Use dry chemical, carbon dioxide, water spray, or foam extinguisher.

**General Fire Hazards/Hazardous Combustion Products:** Toxic fumes of chlorine.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

See  
DOT  
ERG



Fire Diamond


## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Notify safety personnel of spill, evacuate all unnecessary personnel, remove heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against skin and eye contact and dust inhalation.

**Small Spills:** Carefully collect and place in sealed containers for disposal.

**Large Spills:** For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways. Avoid generating dust. *Do not sweep!* Provide an organized procedure of containment, collection, and disposal of contaminated solutions and residues generated during cleanup. Provide separate facilities for decontamination of large equipment. Conduct repetitive wash/rinse cycles separately, either by using different locations or by spacing in time.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120). Also EPA regulations.



See  
DOT  
ERG

## Section 7 - Handling and Storage

**Handling Precautions:** Handle with extreme caution. Take all the necessary precautions to avoid any exposure.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Store in tightly closed and properly labeled containers in a cool, well-ventilated area.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Isolate work areas involving TCDD or TCDD-contaminated materials. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Consider preplacement and periodic medical examinations with emphasis on the skin, liver, nervous and endocrine systems. Regularly monitor glassware, bench tops, instruments, and tools with wipe tests (wipe with filter paper and measure amount of TCDD).

**Personal Protective Clothing/Equipment:** Consider disposable clothing due to the uncertainty of adequate decontamination. Wear protective clothing consisting of both outer (zippered coverall with attached hood and draw string or elastic sleeves, gloves and closure boots) and inner (cotton overalls, undershirts, undershorts, gloves, and socks) garments. For dust or particulate exposure, wear coveralls of a non-woven fabric such as Tyvek or spun bonded polyethylene. For exposure to liquids, wear coveralls, gloves, and boots made of chemically resistant materials such as Saranax coated Tyvek or butyl, nitrile, or neoprene rubber. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For situations where TCDD contamination is low (e.g., exposure to dust contaminated with low levels of TCDD), wear an air-purifying respirator until the extent and characterization of the exposure can be determined. For materials highly contaminated with TCDD, wear respirators that consist of self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive pressure mode. An alternate method utilizes a combination Type C supplied-air respirator, with full facepiece, operated in a pressure-demand mode and equipped with auxiliary positive pressure self-contained air supply. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Shower and change clothes after potential exposures or at the end of the work day. Separate contaminated work clothes from street clothes. Launder before reuse. Place disposable clothing in marked and approved containers for disposal. Remove this material from your shoes and clean personal protective equipment. To prevent cross-contact, provide segregated decontamination locations with separate, controlled, and well-marked entry/exit routes and locations. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Colorless needles.

**Physical State:** Solid

**Vapor Pressure (kPa):**  $7.4 \times 10^{-10}$  mm Hg at 77 °F (25 °C)

**Formula Weight:** 322

**Freezing/Melting Point:** 581-583 °F (305-306 °C)

**Water Solubility:** 19.3 ng/L

**Other Solubilities:** *o*-dichlorobenzene (1.4 g/L); chloroform (0.37 g/L); acetone (0.11 g/L); *n*-octanol (0.05 g/L); benzene (0.57 g/L); (0.05 g/L); methanol (0.01 g/L); lard oil (0.04 g/L)

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** TCDD is relatively stable toward heat, acids, and alkalis. It is changed chemically when exposed in isooctane or *n*-octanol to UV light. Hazardous polymerization cannot occur. Avoid heat and ignition sources.

**Storage Incompatibilities:** None reported.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of TCDD can produce toxic fumes of chlorine. Decomposition begins at 932 °F (500 °C) and complete decomposition occurs within 21 sec at 1472 °F (800 °C).

## Section 11 - Toxicological Information

### Acute Oral Effects:

Rat, oral, LD<sub>50</sub>: 20 µg/kg.

Mammal, oral, LD<sub>50</sub>: 4200 ng/kg produced changes of the liver, kidney, ureter, bladder, and spleen.

### Acute Skin Effects:

Human, skin, TD<sub>Lo</sub>: 107 µg/kg produced dermatitis and allergic reaction.

### Irritation Effects:

Rabbit, eye: 2 mg caused moderate irritation.

### Other Effects:

Rat, oral: 6500 ng/kg/13 weeks (intermittent) caused changes in liver and thymus weight and pigmented or nucleated red blood cells.

Rat, oral: 27 µg/kg/65 weeks (continuous) caused liver and kidney tumors.

Rat, oral: 52 µg/kg/2 yr (intermittent) caused liver and thyroid tumors.

Tumorigenicity, mouse, skin: 97 µg/kg/13 weeks (intermittent) caused diffuse hepatitis (hepatocellular necrosis); changes in spleen; and death.

Human cell: 100 pmol/L caused unscheduled DNA synthesis.

Monkey, oral, TD<sub>Lo</sub>: 92 ng/kg (46 weeks prior to mating, on each day during gestation, and for 17 weeks following birth) caused effects on the newborn (behavioral; delayed effects).

Human cell: 10 nmol/L caused DNA inhibition.

See RTECS HP3500000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** When released to the atmosphere, gas-phase TCDD is degraded by reaction with hydroxyl radicals and direct photolysis (half-life = 8.3 days). Particulate-phase TCDD may be physically removed from air by wet and dry deposition. TCDD may be transported long distances through the atmosphere with surface water sediments being an ultimate environmental sink of airborne particulates. TCDD will absorb to sediment and limit the overall rate by which TCDD is removed from water. TCDD near the water's surface may experience significant photodegradation. 1.5 yr is the persistence half-life of TCDD in lakes. TCDD is generally resistant to biodegradation. Photodegradation on terrestrial surfaces may be an important transformation process. During warm conditions, volatilization from soil surfaces may be a major removal mechanism. Volatilization of TCDD from dry soil surfaces is likely to be faster than from wet soil surfaces. TCDD that has been mixed into soil depths beneath the upper surface boundary will volatilize extremely slowly. On soil surfaces, persistence half-life of TCDD on soil surfaces varies from less than 1 yr to 3 yr. Half-lives in soil interiors may be as long as 12 yr. TCDD is immobile in soil and is not expected to leach. Lateral movement due to surface erosion may occur.

**Ecotoxicity:** No data found.

**Henry's Law Constant:**  $1.62 \times 10^{-5}$  atm m<sup>3</sup>/mole at 25 °C (estimated)

**BCF:** Bioconcentration will occur in aquatic organisms. Due to TCDD's low solubility in water and lipids as well as its low partition coefficient in lipids, TCDD is not likely to accumulate in as many biological systems as DDT.

**Octanol/Water Partition Coefficient:** log K<sub>ow</sub> = 7.02

## Section 13 - Disposal Considerations

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**Section 14 - Transport Information****DOT Hazardous Materials Table Data (49 CFR 172.101):****Shipping Name and Description:** Environmentally hazardous substances, solid, n.o.s.**ID:** UN3077**Hazard Class:** 9 - Miscellaneous hazardous material**Packing Group:** III - Minor Danger**Symbols:** G - Technical Name Required**Label Codes:** 9 - Class 9**Special Provisions:** 8, 146, B54, IB8, N20**Packaging:**      **Exceptions:** 155 **Non-bulk:** 213    **Bulk:** 240**Quantity Limitations:**    **Passenger aircraft/rail:** No limit    **Cargo aircraft only:** No limit**Vessel Stowage:**      **Location:** A      **Other:****Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Listed**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 1 lb (0.454 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Not listed**Section 16 - Other Information**

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

**Zinc**

Issue Date: 2005-05

## Section 1 - Chemical Product and Company Identification

**51/60**

**Material Name:** Zinc

**CAS Number:** 7440-66-6

**Chemical Formula:** Zn

**EINECS Number:** 231-175-3

**ACX Number:** X1002588-8

**Synonyms:** ASARCO L 15; BLUE POWDER; C.I. 77945; C.I. PIGMENT BLACK 16; C.I. PIGMENT METAL 6; EMANAY ZINC DUST; GRANULAR ZINC; HODGSONS ZINC DUST - HYFINE & STANDARD; JASAD; MERRILLITE; PASCO; ZINC; ZINC DUST

**Derivation:** Manufactured by concentrating zinc ore, roasting the concentrate, followed with thermal smelting (reduction with carbon); by reducing the zinc oxide with carbon in retorts from which the resultant zinc is distilled and condensed; or by the hydrometallurgical or electrolytical process where the zinc oxide is leached from the roasted or calcined material with sulfuric acid to form zinc sulfate solution which is then leached from electrolyzed cells to deposit zinc on the cathodes.

**General Use:** Used in alloys (dental amalgams, brass), metallic driers, mixed-metal stabilizers, automotive parts, electrical fuses, storage and dry-cell batteries, in vacuum fluorescence displays, in electrical contact grease, in bearings, in paper defoxing, galvanizing iron and other metals, protective coating, desilverizing agent for lead, deoxidizing bronze, reducing agent in organic chemistry, reagent in analytical chemistry, extracting gold, electroplating, metal spraying, anodic inhibitors, fungicides, nutrition, roofing, gutters, engravers' plates, cable wrappings, railroad car linings, purifying fats, bleaching glue, canteens, and organ pipes.

## Section 2 - Composition / Information on Ingredients

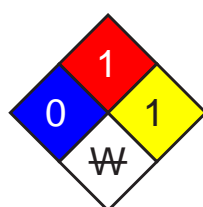
Name	CAS	%
Zinc	7440-66-6	special high-grade (99.990%), high-grade (99.95%), intermediate (99.5%), brass special (99%), prime western (98%).
<b>Trace Impurities:</b> Tin, lead, iron, cadmium, arsenic, cesium, antimony, and zinc chloride (increases corrosion resistance).		

**OSHA PEL**

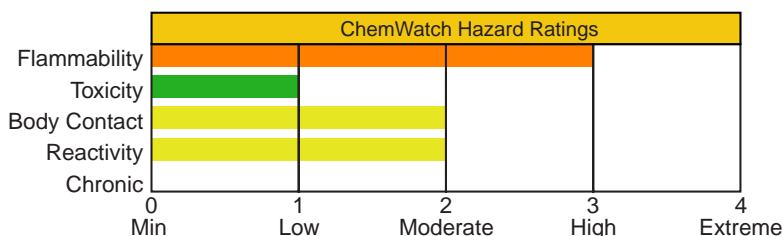
**NIOSH REL**

**ACGIH TLV**

## Section 3 - Hazards Identification



Fire Diamond



**ANSI Signal Word**

**Warning!**

HMIS	
①	Health
①	Flammability
①	Reactivity



Explosive



Flammable

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white lustrous metal with white coating of basic carbonate on exposure to moist air. Dust forms explosive mixtures with water. Dust is flammable, may ignite spontaneously in air.



### Potential Health Effects

**Target Organs:** Respiratory system, eyes, and skin

**Primary Entry Routes:** Inhalation and eye and skin contact

#### Acute Effects

**Inhalation:** Exposure to dust may result in cough. Heated zinc may give off zinc oxide (ZnO) fumes. Characteristics of exposure include sweet taste, dry throat, injury to mucous membrane, cough, weakness, aches, chills, fever, nausea, and vomiting. Concentrations of ZnO particulates at 45 to 870 mg/m<sup>3</sup> cause "metal fume fever," a transient condition characterized by fever, chills, muscle pain, and vomiting. Recovery normally occurs within 24 to 48 hours. Tolerance may develop but is generally lost over a weekend.

**Eye:** Zinc dust particles can irritate the eyes. Zinc salts will precipitate eye protein and cause corneal and lens changes.

**Skin:** A human skin irritant.

**Ingestion:** Relatively non-toxic, though significant ingestion (12 g) of metallic zinc was reported to cause lethargy, light headedness, staggering gait, and difficulty writing, suggesting cerebellar dysfunction. Ingestion of acidic food or beverages stored in zinc or galvanized containers can lead to nausea, vomiting, diarrhea, and abdominal pain.

**Carcinogenicity:** NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

**Chronic Effects:** Abnormally large amounts of zinc may enter and leave the body for years without resulting in symptoms or clinical evidence. Zinc poisoning has been associated with prolonged consumption of water from galvanized pipes. Symptoms include irritability, muscular stiffness and pain, loss of appetite and nausea. Ingestion of excessive doses for prolonged periods alters the immune response and causes copper and iron deficiency, anemia, headache, vomiting, chills, fever, malaise, and abdominal pain.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develop.

**Skin Contact:** Remove contaminated clothing and rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** Maintain hydration and observe for metabolic acidosis, hypocalcemic tetany, anuria, liver damage, gastric perforation, and pyloric stenosis. For pulmonary edema (noncardiogenic), maintain ventilation and oxygenation with close arterial blood gas monitoring. Early use of PEEP and mechanical ventilation may be needed to maintain pO<sub>2</sub> greater than 50 mm Hg with FIO<sub>2</sub> less than 60%. For eye exposure, rinse with 0.05 M neutral sodium edetate to help prevent or reverse a portion of the protein precipitation.

See  
DOT  
ERG

### Section 5 - Fire-Fighting Measures

**Flash Point:** Not applicable, combustible solid

**Autoignition Temperature:** Cloud, 1256 °F (680 °C); dust layer, 860 °F (460 °C); powder 650 mJ spark.

**LEL:** Dust cloud explosion, 0.5 oz/ft<sup>3</sup>

**UEL:** None reported.

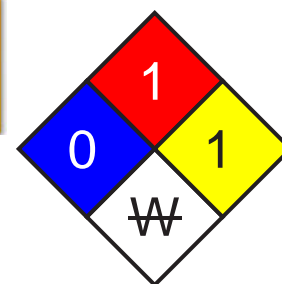
**Flammability Classification:** Combustible solid

**Extinguishing Media:** *Do not* use water or foam. Use a Class D fire extinguisher, dry chemical, dry ground limestone, dry clay, soda ash, lime, or sand, or withdraw from area and let fire burn.

**General Fire Hazards/Hazardous Combustion Products:** Fire will produce irritating, corrosive and/or toxic gases. Inhalation or contact with vapors, substance, or decomposition products may cause severe injury or death. Zinc dust reacts vigorously or explosively on contact with water. It produces flammable gases on contact with water or moist air. It may be ignited by heat, sparks or flames and may re-ignite after fire is extinguished. Dust forms explosive mixtures with air.

**Fire-Fighting Instructions:** *Do not* get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank as rupture or explosion may be imminent. *Do not* release runoff from fire control methods to sewers or waterways as runoff may create fire or explosion hazard. Corrosive solutions may be produced on contact with water. Move containers from fire area if it can be done without undue risk. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in

See  
DOT  
ERG



Fire Diamond



pressure-demand or positive-pressure mode. Structural firefighters' protective clothing will only provide limited protection.

## Section 6 - Accidental Release Measures

**Spill/Leak Procedures:** Eliminate all ignition sources (no smoking, flares, sparks or flames). Isolate spill or leak area immediately for at least 160 to 330 feet (50 to 100 meters) in all directions. *Do not* walk through or touch spilled material. For large spills consider downwind evacuation for at least 800 feet (250 meters). Keep unauthorized personnel away, stay upwind, keep out of low areas, and ventilate area before entry.

See  
DOT  
ERG

**Small Spills:** Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. With a clean shovel, carefully scoop material into a dry, sealed container and move container from spill area. Cleanup personnel should protect against dust inhalation and skin and eye contact.

**Large Spills:** For large spills, dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

## Section 7 - Handling and Storage

**Handling Precautions:** Bulk dust in damp state may heat spontaneously and ignite on exposure to air. . Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Recommended Storage Methods:** Protect against physical damage. Store in a cool, dry ventilated place away from heat and ignition sources and incompatibles.

**Regulatory Requirements:** Follow applicable OSHA regulations.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Routinely evaluate exposure to zinc by collecting personal and area air samples. Prevention of metal fume fever is a matter of keeping exposure of workers below the level of zinc oxide concentration currently accepted as satisfactory for working with metal in the industry (15 mg/m<sup>3</sup>) by employment of proper local exhaust ventilation to collect fumes at their source. Enclose operations and/or provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

**Administrative Controls:** Post hazard and warning information in the work area. In addition, educate, train, and communicate all information on the health and safety hazards of zinc to potentially exposed workers.

**Personal Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator equipped with particulate (dust/fume/mist) filters. Particulate filters must be checked daily before work for physical damage and replaced as needed. If, while wearing a filter cartridge or canister respirator, you can smell, taste, or otherwise detect zinc, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Other:** Separate contaminated work clothes from street clothes. *Do not* take contaminated work clothes home. Launder before reuse. Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to zinc dust. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

## Section 9 - Physical and Chemical Properties

**Appearance/General Info:** Bluish-white lustrous metal or dark powder.

**Physical State:** Solid

**Vapor Pressure (kPa):** 1 mm Hg at 908.6 °F (487 °C);  
60 mm Hg at 1292 °F (700 °C)

**Formula Weight:** 65.38

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 7.14 at 77 °F  
(25°C)

**Boiling Point:** 1666.4 °F ( 908 °C)

**Freezing/Melting Point:** 787.1 °F (419.5 °C)

**Ionization Potential (eV):** 9.39405 eV

**Water Solubility:** Insoluble**Other Solubilities:** Soluble in acid, alkalies, acetic acid

## Section 10 - Stability and Reactivity

**Stability/Polymerization/Conditions to Avoid:** Zinc powder is stable at room temperature in closed containers under normal storage and handling conditions. However, moist zinc can react exothermically and ignite spontaneously in air. Hazardous polymerization cannot occur. Avoid exposure to moisture, heat, and ignition sources (flares, sparks, cigarettes, and open flames).

**Storage Incompatibilities:** Avoid contact with acids, alkali hydroxides (e.g., sodium hydroxide), ammonium nitrate, ammonium sulfide, arsenic oxide, barium dioxide, barium oxide, barium nitrate, cadmium, carbon disulfide, catalytic metals, chlorates, chlorides, chlorine, chlorinated rubber, chromium (VI) oxide, ethyl acetoacetate + tribromoneopentyl alcohol, fluorine, halogenated hydrocarbons, hydrazine mononitrate, hydroxylamine, lead azide, lead nitride, magnesium nitrate, manganese chloride, nitric acid, *o*-nitroanisole, nitrobenzene, nonmetals, oxidizing agents (sulfur, oxygen), paint primer base, pentacarbonyliron, performic acid, potassium chlorate, potassium nitrate, potassium peroxide, seleninyl bromide, selenium, sodium chlorate, sodium peroxide, tellurium, transition metal halides, and water.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of zinc metal/powder can produce hydrogen gas and zinc oxide fumes (of particle diameter  $\leq 1 \mu\text{m}$ ).

## Section 11 - Toxicological Information

### Irritation Effects:

Human, skin, standard Draize test, 300  $\mu\text{g}$  over 3 days intermittently caused mild irritation.

### Other Effects:

Acute Inhalation Effects: Human, inhalation, 124  $\text{mg}/\text{m}^3/50$  minutes, resulted in toxic effects on lung, thorax, or respiration - cough and dyspnea, and skin and appendages - sweating.

See RTECS ZG8600000, for additional data.

## Section 12 - Ecological Information

**Environmental Fate:** Bioaccumulation may be significant (Biological Concentration Factor (BCF) ranges from 85 to 100,000). Zinc can persist in water indefinitely.

**Ecotoxicity:** Chronic aquatic toxicity limits: 0.04 ppm; toxicity to aquatic plants: 25 ppm. Rainbow trout,  $\text{LC}_{50} = 4 \text{ ppm}/48 \text{ hrs}$ ; zebrafish (embryo),  $\text{LC}_{50} = 19 \text{ ppm}/72 \text{ hrs}$ . Zinc accumulates in gill tissue and bone. Zinc is thought to exert its toxic action by forming insoluble compounds with the mucous that covers the gills, by damage to the gill epithelium, or by an internal poison.

## Section 13 - Disposal Considerations

**Disposal:** Reclaim for salvage or reuse. Unsalvageable waste may be buried in an approved landfill. Maximum concentration in effluent to sewer or stream is 1 ppm. Criteria for land treatment or burial disposal practices are under significant review. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

## Section 14 - Transport Information

### DOT Hazardous Materials Table Data (49 CFR 172.101):

**Note:** This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

**Shipping Name and Description:** Zinc powder *or* Zinc dust

**ID:** UN1436

**Hazard Class:** 4.3 - Dangerous when wet material

**Packing Group:** I - Great Danger

**Symbols:**

**Label Codes:** 4.3 - Dangerous When Wet, 4.2 - Spontaneously Combustible

**Special Provisions:** A19, IB4, IP1, N40

**Packaging:** Exceptions: None      **Non-bulk:** 211      **Bulk:** 242

**Quantity Limitations:** Passenger aircraft/rail: Forbidden

**Cargo aircraft only:** 15 kg

**Vessel Stowage:** Location: A      **Other:**



**Shipping Name and Description:** Zinc powder *or* Zinc dust**ID:** UN1436**Hazard Class:** 4.3 - Dangerous when wet material**Packing Group:** II - Medium Danger**Symbols:****Label Codes:** 4.3 - Dangerous When Wet, 4.2 - Spontaneously Combustible**Special Provisions:** A19, IB7, IP2**Packaging:**      **Exceptions:** None      **Non-bulk:** 212      **Bulk:** 242**Quantity Limitations:**    **Passenger aircraft/rail:** 15 kg      **Cargo aircraft only:** 50 kg**Vessel Stowage:**      **Location:** A      **Other:****Shipping Name and Description:** Zinc powder *or* Zinc dust**ID:** UN1436**Hazard Class:** 4.3 - Dangerous when wet material**Packing Group:** III - Minor Danger**Symbols:****Label Codes:** 4.3 - Dangerous When Wet, 4.2 - Spontaneously Combustible**Special Provisions:** IB8, IP4**Packaging:**      **Exceptions:** None      **Non-bulk:** 213      **Bulk:** 242**Quantity Limitations:**    **Passenger aircraft/rail:** 25 kg      **Cargo aircraft only:** 100 kg**Vessel Stowage:**      **Location:** A      **Other:**

### Section 15 - Regulatory Information

**EPA Regulations:****RCRA 40 CFR:** Not listed**CERCLA 40 CFR 302.4:** Listed per CWA Section 307(a) 1000 lb (453.5 kg)**SARA 40 CFR 372.65:** Listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed

### Section 16 - Other Information

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.